Respectfully Presented

To His Highness

Maharajah Serfojee

Rajah of Tanjore

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The Author

TREATISE

ON

CHOLERA ASPHYXIA,

OR

EPIDEMIC CHOLERA,

AS IT APPEARED IN ASIA, AND MORE RECENTLY
IN EUROPE.

BY

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ADVERTISEMENT.

It has long been my intention to prepare for publication a Treatise on Cholera; and I was induced to put my materials into their present form, with the intention of becoming a competitor for the Prize offered by the Russian Government, for the best Treatise on this subject. The disease, however, has lately assumed an importance in this country, which renders it a duty incumbent on every medical man, who has had the opportunities which I possessed, immediately to communicate the results of his experience for the benefit of his own country; and under that impression I now view the Russian Prize as a secondary object.

Had I been left to my own judgment, it is not unlikely that the arrangement of my subject would have been different from that under which it is here treated; but I hardly think that any arrangement could have been better calculated for bringing into view the prominent and important features

of this remarkable disease; and I therefore consider myself fortunate, in having had the directions published by the Russian Government to guide me on the present occasion.

EDINBURGH, 13. CASTLE STREET,
30th June 1831.

CONTENTS.

Page

INTRODUCTORY OBSERVATIONS, ... 1

"I. DETAILED ACCOUNT OF THE NATURE OF THE DISEASE," 7

Names—Varieties—Description—Stages—Character of blood drawn during disease—Duration of disease—State of the mind during disease—Post mortem appearances—Venous congestion—General question of blood-letting—Diseases of sudden collapse, not the result of high arterial action, . 7–27

"II. A STATEMENT OF THE CAUSES WHICH GIVE RISE TO CHOLERA," 29

General Observations—Effect of misnomer—Difficulty of explaining the disease on admitted pathological doctrines—Not an inflammatory affection of the alimentary canal—Not depraved secretion of the gastro-enteric mucous membrane—Not from failure in pulmonary functions—Not depraved secretion of every mucous surface—Venous congestion the effect, not the cause—Source of secretion—In Cholera *Secretion* suspended—Classification of vital *Powers*—1. Sensorial power—2. Respiratory power—3. Circulating power—Case—The bearing of these physiological points on Cholera—General observations on secretion—Discharges from abdominal viscera in Cholera—Sources of nervous energy by which secretion is excited—Cuticular discharges—Case—Conclusions and inferences, . 29–68

Page

" III. Mode of Propagation," 69
History of the disease—Its progress—Peculiarities in its mode of progress—Remote cause, . 69–75

" IV. A Demonstration, by means of exact and faithful Experiments, of its being communicable from one individual to another, if such be the fact," 76
Importance of question of contagion—Points to be discussed—1. Nature of disease—2. Its progress on a great scale—3. Progress in districts of country—Map—4. Its appearance in a camp or city—5. In a sporadic form—6. Can cases said to prove contagious be otherwise accounted for?—and, 7. Is there conclusive evidence that the disease is not contagious?—Its habits in India—In Russia—Effects of belief of contagion on hospital attendants, with reference to the sick—Quarantine restriction—Sanitary cordons—Evil of admitting unproved assertion of disease being contagious, . . . 76–97

" V. An indication of Measures to be adopted for Self-Preservation against Contagion should the Disease prove contagious," . 97
Certain exciting Causes within our reach—1. Whatever is likely to depress general powers of the system—2. Every thing producing chylopoetic derangements—3. Whatever determines to abdominal viscera—Comparative safety in well-built houses and comfortable abodes, . . 97–102

" VI. Of the Means best calculated to ensure Recovery," 102
Indications—1. To relieve oppressed circulation—Rationale of blood-letting—Modus medendi—Rule as to extent—Topical depletion—2. To stimulate the system—Medicines—Frictions—Rubifacients

Page

and vesicatories—3. To restore heat of body—Baths—Best method of applying heat—General result of these steps in treatment—Case—Congestion—Oxygen—Galvanism—Prognosis—Case, with remarks—A Surgeon's account of his own case, and treatment—Remarks—Prognosis—4. To guard against local congestion—in head—in lungs—in liver—5. To guard against reaction—Uncommon—Rather irregular action than reaction—Treatment—6. To produce healthy condition of bowels—Treatment—Patient not safe till alvine discharges are feculent—Sometimes irregular symptoms—Treatment, ... 102–133

APPENDIX, ... 135

Case illustrative of identity of Russian and Indian Cholera—Case treated without blood-letting—Case in which blood-letting was resorted to—Opinions in favour of venesection—Mr Cox's—Mr Trotter's—Mr Duncan's—Mr Owen's—Mr Hunter bleeds from temporal artery—Mr M'Lean in favour of venesection—Mr Mather—Mr Annesley—Mr College's practice, ... 135–149

INDIAN CHOLERA,

OR

CHOLERA ASPHYXIA.

CHOLERA ASPHYXIA.

There is not, perhaps, in the whole circle of diseases to which the human frame is exposed, any one more interesting than that which forms the subject of the present inquiry. The suddenness of the stroke by which a man in perfect health is stretched upon his death-bed—the inevitable fate which seems to await him if left to the unassisted powers of nature—the relief, almost as certain, which is afforded by a proper method of treatment—and, above all, that most important yet puzzling question, from what cause the disease originates, and whether it be contagious—all these are features in the character of this dreadful malady, which excite the most powerful interest even in those who are not professionally called upon to give to them the fullest consideration.

In addition to all these, the circumstances in which the Author found himself placed, in the

course of a considerable portion of his professional life, could not fail to inspire him with an intense anxiety to understand, and be able to overcome, a disease so different from any one with which he had been previously acquainted, and which set all the common rules of practice at defiance.

From the year 1818 to 1827 the Author served as assistant-surgeon in the Honourable East India Company's service within the Presidency of Madras; and during that period the Epidemic Cholera prevailed, more or less generally, in the Peninsula. On his arrival in India, he had the advantage of being placed in the General Hospital at Madras under Mr Surgeon Annesley, who was then in charge of that establishment; and as Cholera then raged to an alarming extent, and in a very destructive form in that Presidency, every opportunity was afforded of observing and studying the disease; and both duty and interest concurred in recommending the study of it to the Author's fullest attention. At Madras, and subsequently in various districts in the interior of the Peninsula of India, he saw the disease under every possible aspect; in all its stages; in every variety of the patient's condition; in the hospital, in the camp, and in private dwellings; among the natives and among Europeans; among those newly arrived in India, and among those who had been long inured to the climate. Patients of every class, native and European, are received into the Madras Hospital; and, at the time when the Author was appointed to do duty under

Mr Annesley, the King's 13th Regiment of Light Dragoons had just arrived from England, while the 84th Regiment of Infantry had, after a long residence in India, reached the coast for re-embarkation; and there was consequently presented the most complete exhibition of the disease, on almost every imaginable condition of the human constitution.

Brought at once, on his arrival in India, into this situation, the Author saw the disease for the first time,—as yet wedded to no peculiar theory, and unembarrassed by any previous dogmas of practice; and he had the good fortune to act under a teacher, who was not only a medical officer of acknowledged skill and experience, but who was at that time minutely and carefully pursuing his investigations into the nature and treatment of tropical diseases. When placed under Mr Annesley, the Author found him prosecuting, with great care, his inquiries into the nature and treatment of the Epidemic Cholera, which was then very generally believed to be a new disease; and he had not only an opportunity of partaking in those inquiries, and of seeing Mr Annesley's practice, but of assisting him in *post mortem* investigations. These opportunities were too painfully interesting to be neglected; and in the course of his subsequent duties in various districts of India, the Author had much reason to congratulate himself, that his attention had been so early and so particularly called to this disease, and that he had become acquainted with it under such peculiar advantages.

It is not therefore as a speculative inquirer that the Author engages in the discussion of this subject. He trusts he has seen too much of the reality, to be in any danger of hazarding rash opinions on mere hypothesis, or risking conjectures on a subject which will not brook such handling. In what he has to say as to the nature and mode of treatment of Cholera, he hopes it will be found, that he supports his statements and views by direct appeals to facts, the result of his own observation and experience, acquired at the bed-side of the sick, where alone accurate data are to be found on which rules of practice or theoretical opinions in medicine can safely rest.

Following the directions and suggestions laid down by the Russian Government, in the humane investigations which his Imperial Majesty has directed to be made; and deriving that confidence from experience and the observation of numerous cases which no other source could have supplied, the Author of this paper now proposes to contribute what he can towards the attainment of accurate conceptions as to the nature, progress, and cure of Cholera.

I. DETAILED ACCOUNT OF THE NATURE OF THE DISEASE.

BEFORE proceeding to the proper object of this section of the treatise, it is of the utmost importance to guard, as much as possible, against the injurious effects which have resulted from the inappropriate names which this disease has received. The epidemic of India has been called Cholera Morbus, Cholera Spasmodica, Cholera Indica, Cholera Epidemica, and, more lately and more appropriately, Cholera Asphyxia.

Of all these appellations, that of Cholera Morbus is the most unfortunate, though perhaps more likely to mislead the student than the practitioner. To the latter, the first case of the disease points out the inapplicability of the name; whereas the student can never get rid of the idea, that he is studying a disease which is seated in the abdominal viscera, and he endeavours to bring every symptom to bear on the disease which has taught him the meaning of "Cholera Morbus." It will be seen in the sequel, that it is of the utmost consequence to forget that the Indian disease has ever received a name so likely to interfere with our attaining a correct acquaintance with its nature.

Cholera Spasmodica is not much more distinctive, as spasms not only occur in the common Cholera Morbus, but are far from being invariably an ac-

companiment of the Indian epidemic; indeed, it often happens, that in the most unmanageable cases there are no spasms.

Mr Scott, in the Madras Report on Cholera, has proposed the term Cholera Asphyxia. And though it would be an advantage to get rid of the word Cholera altogether, still it has become too commonly received a name for this disease to admit of our disusing it.* Asphyxia, in its original signification, is particularly appropriate and distinctive; the disease never continuing for any length of time without producing a suspension of the pulse. In this treatise, therefore, the name which Mr Scott has proposed for the disease shall be used.

Cholera Asphyxia, as it affects different individuals, and from variety, perhaps, as to the state of concentration of its cause, varies so much, as to have induced some practitioners to propose that it should be divided into two species. There can be no doubt that the disease is sometimes much more unmanageable than at others: at such times, every patient seems to be immediately struck with death, and all the efforts of his medical attendants prove

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* Whether we derive Cholera from χολη, bile, or from χολας, intestine, it is equally inappropriate to this disease. Bile does not even appear to be secreted during its progress, and the alimentary discharges are merely symptoms; but, as has been said in the text, it does not now appear advisable to alter a term which has been so long considered applicable to the disease.

unavailing to arrest its fatal progress. This is often found to be the case on the first breaking out of the disease at a station; and it is remarkable, that as the disease is disappearing, it seems to become milder. The insidious nature of Cholera, to a certain extent, accounts for this; for persons not aware of the disease, and unprepared for it, are often beyond recovery before they are known to be attacked; whereas after the alarm has spread, the first symptoms are watched, and the patient is immediately put under medical treatment. But whether mild or uncontrollable, the symptoms and course of the disease are always so well marked, that there appears no reason to encumber our nomenclature by subdividing it into species.

The prominent symptoms of Cholera Asphyxia are very frequently the first intimation to the patient or his friends of the accession of the disease; so that the pulse may be gone, and many of the peculiar serous evacuations have taken place, before the victim is aware of his having more than a slight indisposition. This insidious disease, like the marsh fevers of Rome, commences so frequently during sleep, that some have been inclined to consider this as one of its peculiarities.

There has been naturally much anxiety to discover premonitory symptoms of a disease, which is thus often far advanced to its fatal termination before it is known to exist. But there is no reason to believe that there is any such stage in Cholera Asphyxia; although no doubt, while Cholera prevails in a city or camp, peculiar feelings

of indigestion, loss of appetite, and disordered bowels, are very general. So much indeed is this the case, that "*false alarms*" are, at such times, of frequent occurrence. And it would even appear, that there is a tendency to chylopoetic derangements during the prevalence of Cholera, beyond what may naturally be supposed to result from the dread and horror excited by exposure to the hidden causes of so rapidly fatal a disease, having apparently its seat in the abdomen.

In describing this disease I reckon four stages :—

1. The invasion of Cholera is so insidious, that the individual attacked may be quite unconscious of the presence of the first stage of it. Generally speaking, indeed, it is only to be detected by those well acquainted with the disease, and by careful observation. Not only in this stage, but throughout the whole course of the disease, the appearance of the countenance is one of the most highly characteristic symptoms. An intimate friend, perhaps, observes, that the person attacked has an expression of anxiety, that his complexion is unnaturally earthy, and that his eyes seem sunk in his head. In reply to inquiries, the patient will perhaps deny that he is unwell: he may say, however, that he is a little deaf; and if minutely questioned, he may admit that he has indescribable sensations of being out of order, and that he is unaccountably depressed and listless: he may have no nausea, but he has tormina of the bowels, and perhaps an uncomfortable sensation of heat at the pit of the stomach; the

pulse will be found quick and weak, *(I have never found it have the febrile throb)*; the hands and feet feel cold; the nails are blue, and he has had one or more unnatural alvine discharges. The first of these is generally characteristic; there is a sudden call, and the whole intestines seem to be at once emptied, followed by a feeling of weakness.

Thus, "while the servant (a Hindoo) of Captain "H. was bringing in breakfast, his master was "struck with his appearance, and asked him what "ailed him? he replied he had nothing to complain "of but deafness, which he ascribed to sleeping in "the cold night wind. His master, alarmed at his "looks, sent him to the hospital tent, (the epide-"mic was prevailing in the camp to which this "gentleman belonged): on minute examination the "man was found to have had some suspicious "stools, his pulse had sunk, his skin was cold: He "had Cholera, and became rapidly worse; and "though he was put immediately under treatment, "and was a man of good habits, and strong con-"stitution, he had a hard struggle for his life." *

It is unfortunate that the first stage of Cholera is only to be discovered by the most experienced eye; and that even when the patient himself has a suspicion of his condition, the risk of exposing himself to ridicule, from its being a "false alarm," may keep him silent, while the acknowledgment

* Author's Case Book.

of his fears might have been the means of saving his life. It is to this insidious approach of a malady at all times so mortal, that, in part at least, must be ascribed its being so alarmingly destructive on its first breaking out at a station; patients being extremely apt to allow it to go beyond remedial means before they seek assistance.

2. The second stage of Cholera is more decidedly characterized: The pathognomic appearance of the countenance, to those who have ever seen the disease, is no longer doubtful; the eyes are sunk in the head, the lips are blue, there is a ghastly look about the mouth, and the whole features are shrunk. The patient does not now deny being unwell; he acknowledges having passed some peculiar stools, and probably has had vomiting; these have been followed by great prostration of strength: there is tinnitus aurium, often slight deafness and vertigo; the pulse is more decidedly affected, it is weak and thready; the skin is cold; there is much thirst, and a burning pain at the pit of the stomach; but the tongue is not dry—it is moist and white. When the ratio symptomatum of the disease is under consideration, it will be necessary to take particular notice of the fluid which is passed from the stomach and bowels; at present it is sufficient to say, that it is not alimentary, or excrementitious; it is either a homogeneous and almost limpid, or a turbid fluid; or is like water in which grain has been boiled, with pieces, more or less numerous, of opaque white or yellowish coagu-

lated matter floating in it. The manner in which the discharges take place is characteristic—the desire is sudden, unaccompanied by griping or nausea, and the stomach or bowels are emptied at once, and with some violence: the gastric and intestinal evacuations are similar in their appearance and nature.

3. In the third stage, the appearance of the countenance is still the most prominently characteristic symptom. The eyes, surrounded by a dark circle, are completely sunk in the sockets, the whole countenance is collapsed, the skin is livid, and the expression so altered, that the patient's most intimate friend can hardly recognize him. The surface is now generally covered with a cold sweat, the nails are blue, and the skin of the hands and feet is corrugated, as if they had been long steeped in water; the sensibility of the whole surface is deficient, but it is by no means uncommon for patients to complain of a burning heat in their *cold* skin. Vesicatories do not act; even boiling water does not raise a blister. The voice is hollow and unnatural. If the case be attended with spasms, the suffering of the patient is much aggravated, and is sometimes excruciating. The spasms commence in the hands and feet like cramp; they stretch up the limbs to the trunk, which however they do not always reach. In some cases again the muscles of the abdomen are principally affected, and they are drawn towards the spine during the whole course of the disease. These spasms may have commenced early in the disease, being on some occasions the very first symptom.

The discharges from the stomach and bowels are at this stage very irregular; in some cases they are still very frequent, in others, after one or two evacuations, they wholly cease. The pulse at the wrist, if it have not ceased, is scarcely perceptible, and the heart is beating feebly; and when the spasms are severe, they frequently, even though the pulse be still quite distinct, stop it during the paroxysm. The same effect is produced by excessive vomiting. The breathing is slow and often oppressed: this also sometimes occurs early in the disease; the exhaled breath is cold; and though the heat of the body is some degrees below the standard, the patient throws off the bed-clothes, and beseeches the bystanders to allow him cool air and cold water. Hiccup is not an uncommon symptom.

4. In the last stage the intestinal evacuations have most likely ceased; the eyes, completely sunk in their orbits, are glazed and flaccid, turned upwards, and half-covered with the eyelids; the spasms are now commonly at an end; the extremities, indeed the whole body, is that of a corpse, and the impression communicated by the skin has been well likened to that of "a damp hide;" every artery has ceased to pulsate, and the action of the heart if perceptible is a mere flutter; the whole body is bathed in a cold and clammy sweat: it is painful to witness the oppression of respiration and jactitation of the sufferer. The dying man can still be roused, but when undisturbed he generally appears in a state approaching to stupor; and though often in a humour which might almost be termed sulky, is in

most cases coherent to the last. These symptoms are the immediate forerunners of death.

If blood be drawn during the progress of the disease, it is found in the outset dark-coloured; as the case advances, the blood becomes thick, there is a deficiency of serum, it coagulates quickly, and does not assume the buffy coat. In the last stage of the disease the current in the veins has stopped, and the blood is so grumous that it can scarcely be forced out, in the smallest quantity, through a large orifice.

The whole course of these stages, generally speaking, does not exceed sixteen hours, and unluckily the practitioner is seldom called in until the first, and part of the second stage have passed. The period consumed by each of the above artificial divisions, varies in every case. I have seen instances in which death ensued in less than four hours after the commencement of the disease, and others in which its latter stages, with the pulse quite imperceptible, had already lasted a whole day.

The condition of the mind is remarkably collected during the whole progress of this terrible illness; for though patients, as the malady advances, are unwilling to be disturbed with questions, this appears rather to result from the want of physical energy than from any intellectual failure. Indeed, as the fatal event approaches, the only wish a patient seems to have is to be allowed cold water, and to be left to die in peace. It has been well said,

that a patient in the last stage of cholera may be called " a living corpse."

A curious phenomenon has been several times observed:—After a patient has been some time to all appearance dead, and when the attendants were dressing the corpse, spasmodic twitches have taken place in the limbs, having in some instances even extended to the muscles of the body, and general spasmodic contractions have supervened. This peculiarity, it is believed, has also been observed in Russia.

Cases often occur in which one or more of the above detailed symptoms do not appear. There may be no spasms; the vomiting and purging may early cease, or there may have been only one large alvine discharge, followed by a mortal collapse, the patient seeming to be at once struck with death; and though, on the very first appearance of the disease, he has *walked* to the Surgeon, his pulse is found to be gone, his heart has ceased to beat, blood can be got only in drops from the veins, he lays down his head, and dies without a complaint.

These anomalies are not confined to individual instances, but are found to occur, as Mr Scott well expresses it, in " local epidemic visitations." Thus, he says, " when the disease appears epidemically in " a town or district, or in the lines of a corps or the " camp of a marching regiment, it may on one occa- " sion be distinguished throughout, by the absence " of vomiting, and the prevalence of purging; and " on another, by the excess of vomiting, and, though " more rarely, by the absence of purging. Spasm

"may be generally present in one instance of inva-
"sion; in another, it may not be distinguishable."*

I was on one occasion called upon to send assistance to a district in which the disease was thus described to exist. "It commences by attacking "the sufferer with an agonizing heat in the stomach, "vomiting and purging, and lock-jaw; death ensues "in two hours, and often more rapidly: it bids de-"fiance to every remedy." Extract from letter of the Honourable Mr Harris, Principal Collector, Soonda.

But in all cases there are *the collapsed countenance, blue lips and nails, shrunken fingers, the total failure of the usual secretions, deficient animal heat, suspension of the pulse, and remora in the venous circulation.*

Post Mortem Appearances.—The appearance of the body after death from Cholera Asphyxia, is always peculiar: the whole surface is livid, the countenance collapsed, and the body shrunken, resembling rather the body of a patient who had suffered from a prolonged illness, than that of a victim to a disease of a few hours' duration. It must be borne in mind, however, that the present description is confined to dissections made on bodies in which death had proceeded *immediately* from an active attack of the disease, and that organic lesions are not included, which, though evidently uncon-

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* Madras Report, p. xxi.

nected with the cause of death, have frequently been particularly noted in descriptions of dissections of the bodies of persons who have died from Cholera.

On opening the abdomen, the first peculiarity which presents itself, is the gorged appearance of the veins, and semi-fluid state of the venous blood. The peritoneum and omentum have nothing unnatural in their appearance; the characteristic colour of the viscera is a light pinky hue, shading to purple; and the veins, wherever they are to be seen, appear loaded with black blood. The floating viscera generally, feel more pulpy than usual, as if their coats were thickened; the solid viscera look purple, or are mottled: the stomach may appear full; in general, however, it is partially contracted: the small intestines, though full, are not always distended: And I have almost invariably found alternate portions of the great intestines contracted and dilated. The whole canal is sometimes distended with flatus. The mysenteric veins are in a state of great congestion.

On a more minute examination, the contents of the alimentary canal are found to be a muddy fluid, resembling that which has been passed in such quantities, from the stomach and bowels, during the disease: there are no fæces, but always more or less flatus. The enteric mucus membrane, particularly at the upper portions of the canal, is often coated with a glary and tenacious matter, which would appear to be an accumulation of the coagulated opaque substance which is passed

with the serous fluid. This is not unfrequently in such quantities, at particular parts of the canal, as almost to fill up the tube: its colour is not always opaque white, it has been described as a dark grey; and I have seen it of a greenish tinge. It is said to be sometimes bloody. These slight variations in the colour of this matter, do not appear to affect the nature of the disease; and from Mr Annesley's experiments they would appear often to be attributable to admixture with the remedies prescribed; nor is this matter invariably present. The internal coat of the stomach, and sometimes of a portion of the duodenum, has very generally a peculiar appearance; there are vascular patches, not of inflammation, but as if vessels had burst, and blood had been extravasated between the coats. These spots, though no doubt commonly a congeries of congested veins, do certainly sometimes arise from extravasation. Patches also are described as having the character of inflammation, generally near the pylorus; which are by some considered the result of local irritation, produced by portions of the remedies prescribed having adhered to these parts of the stomach; and they must be taken as a proof that reaction had commenced before death.

Having removed the alimentary canal, venous congestion is still found to be the most remarkable feature of the dissection. The large veins are gorged, and there is no where a trace of arterialized blood perceptible: indeed this has been found to be the case during life; for one surgeon vainly

attempted to get blood from the brachial artery.* The liver is in most cases dark-coloured and mottled, being at its dependent parts usually gorged with black blood; but it is said to have been found, in some dissections, perfectly natural in its appearance. The gall-bladder is generally, but not invariably, full of bile. I have always found marks of congestion in the spleen; but the appearance of this organ seems to be very variable. Dr Christie mentions a case in which he found it empty, and, in the dissections made by the Ceylon practitioners, it seems to have been often found smaller than usual. The urinary bladder is always contracted and empty; the kidneys are healthy, but partake of the character of venous congestion; the substance of the liver, when cut into, is found gorged with black blood, not coagulated, but thicker than usual; the colour of the bile in the gall-bladder is generally green, but I have seen it healthy in appearance; the great veins of the trunk and liver are full of thick impure blood, as are the right auricle and ventricle of the heart. The lungs are black, and in appearance almost of a fleshy structure, and, when cut into, freely give out the same grumous black blood. In some instances this impure blood is even found in the left side of the heart, and to have reached the aorta; and cases

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* Dr Davy on one occasion, in bleeding from the temporal artery, in Cholera, found very little difference between the appearance of arterial and venous blood.

are mentioned in which black blood was found in the carotids.

In the brain there is the same character of venous congestion; but here there is generally some slight appearance of arterial blood;—there is often found a small quantity of serum in the ventricles, or at the base of the brain. The descriptions which have been given, as if portions of the brain had been in a state of high inflammation, are wholly at variance with the character of the disease in its course, and seem rather to belong to a disordered state of the circulation than to disease; except indeed in cases in which death had not proceeded immediately from Cholera, and when reaction had taken place.

Such is generally the condition of the body after death, arising from a *pure* case of Cholera. It may be remarked, however, that in particular dissections, some of the organs here described as being in a state of congestion, are found not perceptibly different from their healthy condition; and instances are said to have been met with, in which the whole abdominal viscera presented nothing very peculiar in appearance. In such cases, (none of which have fallen within the Author's experience), the lungs, or encephalon, will no doubt be found highly congested, and the external veins much loaded.

Before attempting to give the ratio symptomatum of Cholera Asphyxia, a sketch of a successfully treated case of the disease will greatly aid

this elucidation. The above description of the disease, and of the appearances on dissection, which are the result of observations made by the Author when he was unbiassed by theory or hypothesis, will be found, he is confident, to correspond with the descriptions given by all those who have treated of the disease under similar circumstances. And every one practically acquainted with Cholera Asphyxia, must have met with such a case as the following :—

A patient is brought into hospital in what has been called the third stage of the disease : his countenance is sunk ; he has vomiting and purging ; his skin is cold ; his nails are blue ; his pulse is scarcely perceptible ; his breathing is oppressed, and he has spasms in the extremities. He is immediately placed in warm blankets ; stimulants, including a dose of calomel, are administered ; and a vein is opened in each arm, with the largest orifice. At first the blood flows very sluggishly, perhaps it is only procured by kneading the arms, but by and by the stream is more free, and as the blood flows it is improved in its colour ; the patient feels the greatest relief, *the pulse rises,* and the colour of the blood testifies that the lungs are restored to their function. Little else is necessary ; the patient has a second dose of calomel administered to him, is left in a warm bed, and falls asleep. In the course of a few hours a cathartic is prescribed, to remove the colluvies which the restored secretions are pouring into the intestinal canal. It only re-

mains to guard against local congestion and re-action; but in general, in a case treated as above, there is no such interference with recovery. The suspended functions seem to be at once restored: the blood is arterialized; the animal heat returns; the excrementitious secretions take place, and the kidneys recover their functions. And it is particularly worthy of notice, that even persons the most ignorant of the doctrine of diseases, who are at all accustomed to see cases of Cholera, are aware that the passing of urine by the patient, is an unerring test that the disease has been overcome.

This summary of a successfully treated case of Cholera is given, not as an anticipation of the observations on the practice, (which of course belong to a subsequent division of this Essay), but because the rationale of treatment is often an important help in our endeavours to understand the nature of a disease. And what has been said seems fully to warrant the conclusion, that Cholera is, early in its progress, a disease in which the due proportion between venous and arterial blood is destroyed. No stage of the disease has been hitherto discovered, in which venous blood does not preponderate in the system: let it be observed, too, that this is found to be the case so immediately after what must be considered the accession of the disease, that had the venous congestion been the consequence of high action, that stage must have been discovered. For instance, a man in high health and spirits accompanies his companions to bathe;

he is seized, while in the water, with vomiting and purging, or with spasm, is brought immediately to a surgeon, and is found in what the Author has called the second stage of the disease. This is not by any means an extraordinary example of the sudden and unlooked-for manner in which this remarkable disease makes its attacks. Or a man goes to bed perfectly well, and is roused at three o'clock by a call to stool; animal heat has already failed, and in three hours he is dying.

In what to all appearance, therefore, is the very outset of the disease, the nails and lips are blue, the animal heat sinks, the action of the heart is lowered, arterial secretion has ceased, and if death ensue, every vein is found congested, while the arteries are empty. But what is far more valuable in a practical point of view, this position may be illustrated by the effect of the medical treatment: We have a patient suffering under extreme prostration of strength, and the pulse is scarcely perceptible, perhaps is not to be felt; we remove blood, and as it flows the pulse rises, the powers of life return, and if we can sufficiently relieve the oppressed system, nothing more is necessary to save the man's life.

It may be said, that this point is unnecessarily pressed, as it is generally admitted that the disease is one of venous congestion; but, though it is acknowledged by most practitioners that ultimately there is venous congestion, still they are so much trammelled by the opinions of the schools, that they

find it difficult to admit this state sufficiently early in the disease. Bleeding is found a successful remedy in their own hands or by others; but then bleeding is indicated only when there is increased action, and they are searching in vain, in the earlier stages of Cholera Asphyxia, for a period of high excitement. Nay, we find ingenious pathologists doing their utmost to prove, in their dissections, that inflammation has actually existed; and, in the face of evidence which, to unprejudiced minds, would be demonstration, such reasoners persist in regarding the disease as one of excited vascular action throughout its whole course.

Before proceeding farther, it is very important to say a few words on the general question of blood-letting, not only to satisfy such reasoners that the removal of blood may remove prostration of strength, but to clear the way for the Author's explanation of the nature of Cholera Asphyxia.

There are two opposite conditions of the system, in which it may be advisable to withdraw a portion of the circulating blood. The first, when high general arterial action exists, or when local inflammation has taken place: in such circumstances bleeding is called for, because it is necessary to lower the heart's action, or, it may be said, because arterial blood unduly preponderates in the system. Indeed this may be regarded as the fact, for in cases of highly excited action, the blood circulating in the veins will be found to retain the arterial hue.

The second state of the system in which blood-letting is expedient, is when the balance of the circulation is depressed on the other side, and the venous blood is in excess.

Fever, Peritonitis, and Acute Rheumatism, are examples of the first, and Cholera Asphyxia is the most remarkable example of the second which practice presents. The condition of the system in Cholera has been already spoken of; but a case of more common occurrence, which affords an example of bleeding being indicated to remove an excess of venous blood, will supply a farther illustration. When there is a broken rib, the action of the chest being impeded, respiration is checked, the blood thrown into the lungs is not purified, the circulation is obstructed, and venous blood soon preponderates in the system. In such a case, therefore, we bleed not merely to ward off inflammation, but in order to reduce the blood requiring the function of the lungs; so that the quantity thrown into those organs being proportioned to their restricted capacity, they may be enabled to prepare it for arterial circulation.

But, in the latter class of cases, it is not indifferent whether we draw blood from an artery or a vein—a practitioner who would open the temporal artery of a patient whose lungs were clogged with unarterialized blood, would increase the risk of suffocation. Yet we actually find Indian writers so completely mistaken in the rationale of blood-letting in Cholera, that they narrate their attempts to

remove blood by the temporal artery, when the surface is livid, and after the arteries have ceased to beat.

There is another preliminary consideration, which has been lost sight of by many inquirers into the nature of Cholera, viz. That diseases of sudden collapse are not necessarily preceded by a state of high arterial action.—Where, it may be asked, is such a stage in the instantaneous debility produced by the poison of a viper? But it is needless to leave the doctrine of diseases to illustrate this fact. Intermittent fever is almost a case in point: On the approach of a fit of ague, the symptoms are those of great depression; there is lassitude, and weariness of the limbs, followed by chilliness; the nails and lips become blue, the countenance sinks, and shivering ensues; and there are, in some cases, spasms of the extremities. In short, the condition of the system approaches to that which prevails in Cholera Asphyxia; and there can hardly be a doubt, that in the cold stage of fever the balance of the circulation is interrupted, and that venous blood preponderates in the system.

In 1825, when in India, and while maturing these opinions on the nature of Cholera, the Author was called to the capital of a native prince, (Tondeman, Bahadur), to treat a very violent fever which was committing great ravages; and he had then an opportunity of seeing the occurrence of death, in what there was every reason to consider the cold stage of an intermittent. The first in-

stance in which this happened was in the case of the principal minister of the Rajah. This patient had suffered from remittent fever for some days. When first visited, though much weakened, he was free from feverish symptoms; and on the following morning he continued convalescent: about mid-day, however, he was attacked with what had all the character of the commencement of an intermittent fever; he had a severe fit of ague, but instead of the hot fit ensuing, the symptoms of collapse continued, the coldness of the extremities became death-like, the pulse failed, the countenance sank, and the man died in the evening.

Two similar cases occurred at the same time. There was no epidemic Cholera in the district,—the prevailing disease, at the place in question, was a violent remittent fever, followed, as is very common in India, by an intermittent; and such was the termination of many of the cases at that time under treatment, in all of which the primary fever was similar to that in the cases which proved fatal. Unfortunately, from the *caste* of the patients, it was impossible to obtain post mortem examinations of those interesting cases; but there can be little doubt that venous congestion would have been found the principal character of the dissection.

Collapse then may occur without previous high action; it is produced by many poisons—we see it in Ague, and it occurs in Cholera.

II. A STATEMENT OF THE CAUSES THAT GIVE RISE TO IT.

Most practitioners in India seem to have been impressed with the belief, that the disease which has obtained the name of Cholera is, if not a disease sui generis, a malady very peculiar in its character; many theories have consequently been proposed in explanation of its nature. Not one of these, however, will be found to account for all the phenomena of this very remarkable disease; and some of the most intelligent surgeons have not been able to satisfy themselves of the rationale of the line of practice, which, even in their own hands, has proved most successful; for, while pouring in with one hand the most powerful *stimulants*, they were *depleting* their patients to the utmost with the other. Hence, the opinions on the nature and treatment of Cholera have become so conflicting, that the disease is very generally believed not to be understood; and its treatment is considered to be mere guess-work.

Early in the Author's practice in Cholera, he, like others, was impressed with the paramount importance of becoming acquainted with the true

nature of the disease; not merely to direct his practice, but also in the hope of being enabled to explain the rationale of what, by general consent, was admitted to be the most successful mode of treatment.

The first case he saw satisfied him, that the term *Cholera Morbus* was, while wholly inapplicable, calculated to mislead all who had never seen the disease. No doubt, discharges upwards and downwards are common to this and to the disease which had already obtained the name of *Cholera Morbus;* but this bare fact may be said to be the full extent of the analogy—for even the nature of the evacuations in the two diseases is totally different; and in no other symptom do they bear any resemblance to each other. But this misnomer has not only proved a stumbling-block to those practically unacquainted with the disease, it has been in the way at every turn—treatment is indicated and controlled by it, and the most elaborate hypotheses in explanation of the disease have been shackled by it.

The vomiting and purging of the Indian Cholera are in truth of very secondary importance in indicating the treatment of the disease; every practitioner, not misled by a name, or blinded by a theory, being aware, that as soon as the balance of the circulation is restored, the symptoms which have thus led away the pathologist at once disappear.

In the course of the Author's inquiry into the nature of Cholera, it became evident to him, that the

symptoms, course, and effects of the disease, could not be explained on the received doctrines of Pathology. He found, that even had dissection afforded, as some imagined, evidence of high inflammatory action having existed, no hypothesis on the nature of the inflammation would support the idea of this state being present, when every artery has ceased to beat, and when the action of the heart is no longer perceptible. He found, that pure nervous debility, in its usual acceptation, would not explain the disease; for when the body was like a corpse, asphyxiated and cold, the patient could walk, retaining his sensorial and voluntary powers. Neither was depraved secretion sufficient; for the breath was cold, and the skin blue, so that arterialization must have been deficient; and to all appearance every *secretion* was at an end.

The respiratory system would not serve the purpose; for though, no doubt, when the lungs are as it were clogged up, the breathing becomes laborious; yet this, to any extent, was not an unfailing symptom, and seemed always, when present, to be the result of the morbid condition, and not its cause.

Here then was a disease in which, although there were great discharges of serous fluid from the alimentary canal, all the natural secretions were at an end, the animal heat had disappeared, the heart and arteries had ceased to act, and the blood in the veins was impeded or stopped; yet the sensorial

and respiratory powers were little, if at all impaired.

The questions thence suggested are,—

I. Is this a local or a general affection?—and,

II. Is it vascular or nervous?

I. Though, no doubt, a severe and extensive affection of the alimentary canal will produce serious interference with the circulation, still, under such circumstances, we should have no reason to expect so complete a state of Asphyxia as occurs in the disease under consideration. In an inflammatory condition of the gastro-enteric canal, the action of the heart may be affected, and the pulse become thready; but the skin does not become livid, nor the body cold;—and every one who has considered the post mortem examinations of victims to Cholera is aware, that it is even questionable whether partial appearances of inflammatory action can be discovered, far less those of extensive inflammation. The immediate and complete recovery from a state nearly of death, which so frequently follows successful treatment in Cholera, is wholly at variance with the doctrine, that the disease is an extensive inflammation. An inflammatory affection of the alimentary canal cannot, therefore, be regarded as the immediate cause of Cholera.

If the symptoms were entirely restricted to depraved secretion into the stomach and intestines, we might be justified in considering the disease a local affection of the gastro-enteric mucous mem-

brane. But, truly, the vomiting and purging are of very secondary consideration. The skin is blue, the surface cold, the arteries empty, the veins loaded, and the current of their blood stopped throughout the whole periphery; and in such a condition of the system, we cannot be justified in supposing that there is an increased, even though depraved, secretion going on within the alimentary canal. And if we are to consider the disease as the result of a local affection, the evil might with more propriety be ascribed to the pulmonary function. But that it is not the result of a failure in this important function, is proved by there being frequently no marked symptom referable to the chest, and by the disease being generally advanced in its course before the respiration becomes oppressed. This supposition is also irreconcilable with the known immediate effect which the suspended function of the lungs produces on the sensorium.

Cholera, therefore, cannot be referred to a topical affection of any of the great organs—the sensorial, respiratory, or alimentary.

The difficulty of accounting for all the symptoms, on the supposition that the cause of Cholera is a local affection of some of the great viscera, has led to the hypothesis, that it is an affection of every mucous surface, and that it consists of a depraved condition of the secerning function of those surfaces;—but this implies, that secretion is excited on the most extensive surface of the body, when that

surface is nearly or entirely deprived of arterial blood; for in Cholera the discharges continue after the circulation has to all appearance ceased.

2. Every dissection, after death from Cholera, proves, that this disease produces great venous congestion; and, there can be no doubt, that such a state of the system invariably exists in Cholera. But this must be regarded as the effect, and not the cause of the disease. Blood drawn from a patient labouring under Cholera, is not only much blacker than usual, but is generally grumous; and, late in the disease, attains the consistence of tar. This must still be regarded as the effect, and not the cause of the disease; for, were the immediate cause of a disease such a morbid condition of the circulating blood, as to destroy those organic functions which are found to have failed in the very commencement of Cholera, the sensorium would equally suffer, and insensibility would accompany the other symptoms.

It is not therefore likely, that Cholera Asphyxia results from a morbid state of the circulating blood.

When in the animal body we find a *circle* of actions performed, distant parts united in function, and the flow of fluids to particular organs determined, controlled or suspended, as may be necessary for certain purposes; whatever may be our notions with regard to *contractility*, we must attribute such combined actions to the power of the nervous system. And whatever may be our opinions as to the nature of those processes from which the various

secretions immediately result—whether we consider them chemical, or mechanical, or ascribe them to an unknown vital principle,—still the determination of the pabulum to the secreting surfaces, must be attributed to a general, and not to a local agent. The nervous system stretches itself out to every point of the body, and we find it distributed most largely where we may expect the energy of such an agent to be most required; demonstrating, as it were, that those actions on which the performance of the various organic functions depend, are traceable directly to this system. Hence we seem to be justified in concluding, that if we find, by disease or accident, that an entire class of the involuntary functions of the living body is at once suspended, such suspension must be ascribed to an injury to that portion of the nervous system by which these functions are carried on.

In Cholera, in the very outset of the disease, all secretions, properly so called, are found to have failed; the alimentary ejecta are not gastric juice, pancreatic fluid, bile, mucus, or excrementitious matter. The kidneys cease to secrete urine; saliva no longer flows into the mouth, nor are the eyes moistened with tears; carbonic acid gas is not thrown off in its usual quantities from the lungs, and animal heat is not evolved in the body. Here then is a disease, which consists of a suspension of a great class of involuntary functions; and it appears to be a fair conclusion, that its immediate cause is to be sought for in the nervous system.

At this stage of our inquiry the question occurs,—How can a disease be considered a nervous failure, in which we find the sensorium, the respiratory, and the voluntary powers unaffected? The answer to this difficulty may be comprehended in the following propositions, which imbody the conclusions on this subject at which the Author has arrived.

1. The great ganglionic or sympathetic system of nerves, is possessed of a power wholly unconnected with cerebral influence, which it may retain after the brain and spinal marrow are removed, and which may cease to exist while these retain the full exercise of their functions.

2. To this system belongs the circulation and distribution of the blood; and it consequently has a most important share in regulating secretion, and in carrying on the involuntary functions. And,

3. To the suspension of this power of the system, is to be ascribed the disease which has obtained the name of Cholera Asphyxia.

These conclusions are the result of an intimate practical acquaintance with this disease, and an anxious study of all its phenomena; and they are supported by a careful and minute inquiry into the nervous system in all its bearings. A disquisition on the subject would be out of place here; but still it is necessary to state some physiological distinctions, not generally received, but which appear to the Author to be well founded, and which he thinks

may be rendered of much value in pathological inquiries.

Physiologists have proposed various classifications of the powers of the system in the perfect animal. We have the animal and organic life of Bichat; the sensorial, nervous, and muscular powers of Phillips; the contractility and sensibility of Bostock, &c.—The classing of muscularity with the brain and nerves seems plainly objectionable; for though Bostock considers contractility as a power independent of the brain, or of nervous agency, it is difficult to detect its independent operation; and such a *separation* seems worse than useless in a living organized body, in which we are in danger of losing sight of the true source of action, in restricting our attention to contractility as a power independent of nervous agency. No doubt, a muscle, removed from the body, can, for a longer or shorter time, be excited to action, according to its nature; but this muscle is still supplied by innumerable ramifications of nervous filaments, and we must destroy their vitality before it can be considered as proved, that the contractility of the muscle is independent of nervous agency. On the other hand, it is unquestionable, as is exemplified in death by electricity, and by the operation of certain poisons, that whatever destroys the excitability of the nervous system puts an end to muscular contractility.*

* The contraction which boiling produces, can scarcely be considered similar to living contractility: besides, a muscle has

It appears to me, that *disease* has not been sufficiently considered in the classifications of the powers of the system; and that, by keeping the effects of various diseases, accidents, or poisons, in view, the agents carrying on life in the more perfect animal system, might be brought within a simple intelligible classification, regulated by the following proposition:—That we are to consider as belonging to a distinct *power* of the system, any set of complicated actions and functions which can exist independently of the other powers of the system, and which, when destroyed, leave the other powers entire. For example, a man gets a blow on the head, and is immediately deprived of his mental faculties, his senses, and all voluntary power of motion; but, though he has stertorous breathing, from the loss of controul over the muscles connected with the air passages, his respiration is little affected, and the circulation of the blood goes on regularly. In such circumstances, there is clearly a suspension, or destruction, of *a source* of faculties and actions, which, though necessary to the existence of a complicated system, is independent of other powers which are in operation for the preservation of life.

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also expansibility; so here is another power. In fact, even in admitting that contractility has an independent existence, we advance little in the explanation of its excitement, controul, continuance, regulation, and suspension, which the various motions and actions of the system are constantly calling forth; while the altered power which cerebral or nervous affections produce, proves how great the influence of the brain and nerves must be on muscular action.

Keeping this general proposition in view, then, the powers carrying on life in the more perfect animal may be divided into three: viz. the sensorial; respiratory; and the sympathetic, ganglionic, or organic.

I. The limits of this Essay do not admit of such a disquisition as would be necessary fully to illustrate the correctness of this classification. It is sufficient to observe, that the nature and extent of the sensorial power is exhibited in apoplexy, in injuries of the head, in acephalous children, and in experiments on animals after the brain has been removed, or with poisons which suspend the sensorial influence, without affecting the other powers of the system.

II. Respiration is so important to life, that neither disease nor accident can suspend it for more than a very short time, without the other powers being annihilated. But still its independence of the sensorial and sympathetic systems can be demonstrated. In apoplexy, and other causes of stupor, respiration continues after the sensorium has failed; and the same thing can be proved, by removing the cerebrum and cerebellum of living animals. The following experiment of Mr Brodie proves, that respiration is also independent of the power which circulates the blood.

Mr Brodie inoculated the thigh of a dog with the Upas Antiar. 'In twelve minutes the dog

'was languid. In fifteen minutes the heart was 'beating very irregularly, with frequent intermis-'sions, and there was a slight rigor. In twenty 'minutes, the heart was beating feebly and irre-'gularly; he was sick, and vomited; but the res-'pirations were as full as under natural circum-'stances, and he was perfectly sensible. At the 'end of twenty minutes he suddenly fell on one 'side, and was apparently dead. The thorax was 'immediately opened: the heart had ceased con-'tracting, and was distended with blood; there 'was one distinct full inspiration after the dissec-'tion commenced.'*

This was not a solitary experiment; and, in a foot-note, Mr Brodie mentions that M. de Lile had found that the Upas Tieutte entirely suspends the power of respiration, without immediately destroying the sensorium.

It has been shown that Cholera Asphyxia affords a remarkable illustration of the fact, that respiration may continue free after the circulation to all appearance has ceased.

Having thus shortly pointed out grounds for ascribing independent action to the powers which peculiarly belong to the more perfectly organized classes of animals, the purpose of introducing these speculations in this Essay renders it necessary, that a fuller consideration should be given to what is considered a third power of the system.

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* Philosophical Transactions, 1811.

III. The circulating power.

The most important function of this power of the system being the circulation and distribution of the blood, the term circulating power, although not the most scientific which might be chosen, seems sufficiently expressive of the sense in which it is here employed.

The seat of this power is, I conclude, in the ganglionic system of the great sympathetic nerve. But it would be out of place here to enter into a disquisition on the nature of this system, from its first appearance in organized life, to the condition in which it presents itself in the more perfect animal.

The sympathetic nerve is said to arise from the sixth nerve of the skull. But really this derivation of the great system of abdominal ganglions and nerves is worse than useless, since it leads the inquirer astray from the true nature of this portion of the animal system. The branch of the sympathetic which joins the sixth, is no more to be regarded as the origin of the sympathetic system of nerves, than is the branch which joins the eighth, or fifth, or any one of the branches which join the spinal nerves. And if the Author's idea of the nature of the abdominal nervous system be correct, we must view these merely as nervous communications between the different powers of the system.

My opinions as to the nature of the sympathetic nerve are founded on pathology, and were originally formed in my endeavours to discover the true nature of Cholera Asphyxia. They are further sup-

ported, and in truth established, by the experiments of others.

I regard the semi-lunar ganglion and the solar plexus as the principal source of the energy of the sympathetic system. And it appears to me, that the integrity of this system is necessary to the complete circulation of the blood, and to the progress of inert fluids in non-muscular vessels. It has been proved by Mr Charles Bell, that towards the perfection of voluntary muscular motion, not only is a nerve of motion requisite, but one of sensation. And I conceive, that towards secretion, not only is a medullary nerve required, but a branch of the sympathetic system, which, without intending it as a perfect analogy, may be illustrated by the necessity of the presence of both the positive and negative wires towards galvanic operations.

According to this notion, the sympathetic system must possess an important share in the function of secretion.

It is difficult to say to what extent the sympathetic system has subservient to it contractility.*

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* I think it is evident, that the current of venous blood can neither be maintained by the power of the left ventricle of the heart, nor by the "*suction*" of the right side of the heart, while the current in the lymphatics, lacteals, and all non-pulsating vessels, cannot be accounted for on the doctrine of contractility.

Dr Sharpey has discovered, that certain animals have even a power of giving motion to fluids which are external to their own bodies, and which cannot be referred to muscular action. Seeing

It does not appear to have any power over voluntary muscles. To it may belong the expansile and contractile properties of the arteries, and the purely vermicular motions of the intestines.* But there is no occasion to pursue this farther, as it is not indispensably necessary for my present purpose.

As already said, the classification of the powers of the system which I consider best adapted for pathological inquiries, is founded on the proposition,—that any circle of actions which can exist independent of the other powers of the system, and which can be destroyed without their immediately failing, is *a power*. The fact is best ascertained by disease, because experiments with the knife may destroy more than one class of actions. But there are some experiments which assume very much the character of disease, viz. those with poisons.

One of Mr Brodie's very interesting series of experiments with poisons, has been cited above, (*vide* p. 39.), and is applicable to the present head, as proving that the circulation may be destroyed, leaving entire the other powers of the

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that the tadpole and mussel possess such a controul over foreign fluids, we surely shall not arrogate too much to the vessels of the more perfect animal if we conclude, that they are enabled to propel their contents independently of contractility.

* When Dr W. Phillip divided the Parvagum, he found reason to believe, that though the animal lost the power of emptying its stomach by vomiting, still it possessed the ability of passing slowly on the digested food.

system. Another of those experiments is no less illustrative of my present view. Mr Brodie found, that certain poisons, while they destroyed the sensorium and respiration, left the circulation unaffected; and that the heart continued to act, and to circulate black blood, some minutes after voluntary motions were at an end; and he concluded, that could he support the circulation sufficiently long, to overcome the injury done by the poison to the brain and respiratory system, he would resuscitate the animal. He describes the experiment as follows: "Some woorara was inserted "into a wound in a young cat; she became affect-"ed by it in a few minutes, and lay in a drowsy "and half-sensible state, in which she continued "at the end of an hour and fifteen minutes, when "the application of the poison was repeated. In "four minutes after the second application respi-"ration entirely ceased, and the animal appeared "to be dead; but the heart was still felt acting "about 140 times in the minute. She was placed "in a temperature of 85° of Fahrenheit's ther-"mometer, and the lungs were artificially inflated, "about forty times in a minute.

"The heart continued acting regularly.

"When the artificial respiration had been kept "up for forty minutes, the pupils of the eyes were "observed to contract and dilate on the increase "or diminution of light, saliva had flowed from "the mouth, and a small quantity of tears was col-"lected between the eye and the eye-lids. But

" the animal continued perfectly motionless and " insensible.

" At the end of one hour and forty minutes from " the same period, there were slight involuntary " contractions of the muscles, and every now and " then there was an effort to breathe. The involun- " tary motions continued, and the efforts to breathe " became more frequent. At the end of another " hour the animal, for the first time, gave some signs " of sensibility when roused, and made spontaneous " efforts to breathe 22 times in a minute. The ar- " tificial respiration was discontinued. She lay as " if in a state of profound sleep for forty minutes, " when she suddenly awoke and walked away. On " the following day she appeared slightly indis- " posed ; but she gradually recovered, and is at " this time still alive, and in health."*

In this experiment we have a proof that the power which circulates the blood may retain its energy for forty minutes after the perfect death of the sensorial and respiratory powers. But, at the same time, the fact that the various powers of the system are not wholly independent of each other, is proved by other experiments similar to this. Thus Mr Brodie found, " that the circulation of the blood may be " maintained in an animal from whom the brain has " been removed, for a considerable, but not for " an unlimited time."† The experiment cited at

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* Philosophical Transactions, 1812, p. 207.

† Ibidem.

page 39. proves, that the power which supports the circulation may be destroyed, yet the sensorium and respiration remain, for a time, unaffected.

The peculiar and remarkable symptom of Cholera Asphyxia is, that after the heart has ceased to beat, and when the blood appears no longer to be circulated, the respiratory and sensorial powers continue wonderfully entire, so that the condition of the patient is not very different from that described as produced by *Upas Antiar*.

The following case, which occurred early in the Author's practice in India, will serve to illustrate this peculiarity of the disease:—

Arcot, 26th July 1819.—Ensign W. æt. 18. had only been a few weeks in India—on his march to join his regiment. This young gentleman had a feverish attack, some stages back, but has been able to accompany the detachment in his palanquin, and had yesterday quite recovered. He, this morning after breakfast, sent his servant for a dose of salts, without reporting himself sick. I saw him about ten o'clock A. M. He said he had not felt well after the morning's march, and as he required medicine, he had no doubt the salts, which he had just taken, would set all to rights.

At three o'clock P. M., while in attendance on a sepoy who was dying of Cholera, it was reported to me that Ensign W. was attacked with the disease. On reaching his tent, I found him in the third stage of Cholera Asphyxia. The vomiting and purging had nearly ceased. His skin was

cold—his pulse not perceptible—much thirst—spasms of the extremities—countenance sunk. He was perfectly collected. He said, that soon after I had seen him he had been purged, and that he had vomited up the salts. He had been then attacked with cramps, but he did not suspect Cholera. I immediately attempted to bleed him, but could not, even by kneading the arm, procure above a few drops of grumous blood. Calomel and opium, laudanum and ether draughts, and hot brandy and water, were administered. Bottles of hot water were applied to the extremities, frictions and shampooing, &c. resorted to. All was vain; clammy and profuse perspiration broke out, jactation came on, and he was a corpse by eleven o'clock P. M., retaining his mental faculties till the last; having been able to give information relative to his friends in England, immediately before his death.

But as it is important that this point should be established, the Author will here adopt the language of other practitioners in describing the condition of patients labouring under Cholera. Mr Marshall, when staff surgeon at Ceylon, (1819), says, "In a few instances the vital energies appeared to be rapidly depressed, and indeed almost extinguished; and every endeavour to arrest the progress of the disease became unavailing. One man, a Caffree sergeant, whom I saw at half past six P. M. in apparent good health, was suddenly seized at half past seven P. M. with a slight uneasiness in his bowels, which was fol-

"lowed by one watery evacuation, and once or "twice he belched up a little watery fluid from his "stomach. Warm water being in constant readi-"ness at the hospital, he was in a warm bath by "about ten or fifteen minutes after the griping "pain came on. A scruple of calomel, with a "stimulating draught, were instantly exhibited; a "vein was opened while he was in the warm bath, "but very little blood flowed. All the means em-"ployed were of no avail; the mortal symptoms "became rapidly aggravated, and, by a quarter "past nine, he had expired."

Dr Davey, Physician to the Forces, Ceylon, (1819), in the report of a case, five hours after the accession of the disease, observes, "I could "perceive no pulse of the heart or arteries; his "extremities were cold, the whole surface of the "body cool and bathed in sweat; even the axilla "felt cool, the thermometer in it did not rise above "96°; under the tongue, it was stationary at 97°. "I asked if he felt any uneasiness about the chest, "he replied, not the least; his breathing was "quick, about 34 in a minute, not laborious; he "said he had no fixed pain anywhere, nor was pain "produced by pressure on the abdomen. Cramps "occurred frequently in different muscles, parti-"cularly of the inferior and superior extremities, "and in the abdomen; and once, while I was "present, the muscles of the face were severely "affected, as in Trismus. The spasms were of "short duration; they were so painful, that under

"the agony they occasioned, the patient cried "aloud. The tongue was clean; he was rather "thirsty, and often called for water. Whilst I "was with him (about an hour) he had no vomit- "ing or retching, or evacuation from the bowels; "an enema that was prescribed was not retained. "His expression of countenance was wild; his "eyes sunk a little; his features not collapsed; "his expression was agitated; his intellect clear." This man continued conscious to the last, and quietly expired after ten hours' illness.

Mr Farrell, Deputy-inspector of Hospitals, Ceylon, (1819), in his observations on the reports on Cholera, made by the medical men in that island, says, "When the heart ceases to act; when the "countenance collapses, and the eyes sink deep in "the orbits; when the body becomes cold and has "a death-like appearance, the more frightful from "the faculties of the mind and the power of "speech remaining in the living corpse;—when all "this takes place in less than one hour from a state "of perfect health, what can be said of it, but that "it is the work of the hand of death?"*

According to Dr Christie, "Sometimes, when "the pulse is scarcely perceptible at the wrist, the

* I have taken the liberty of making these quotations from the manuscript reports of the Ceylon Medical Officers, the use of which has been kindly afforded me by Sir George Ballingall, in whose possession copies of them are.

"patient is still able to walk; and long after the "pulse has ceased at the wrist, (although perhaps "not able to move about), he is often sufficiently "strong to sit up, to use his arms and hands, to "speak,"* &c.

These quotations (and similar passages occur in every work on Cholera) are sufficient to satisfy any unprejudiced mind, that after Cholera has put a stop to the circulation of the blood, the sensorial and respiratory powers retain their functions. The Author's own observations of the phenomena of the disease, coincide in every particular with the reports just cited. Indeed, it was from finding this fact so prominent in this remarkable disease, that he was first led to draw the above physiological inferences.

The indispensable necessity of arterial blood for the due performance of the functions of every part of the body, makes it a very remarkable feature of Cholera, that the mental faculties should be retained, apparently in such perfect preservation, after the heart must have ceased to send, in due quantity and quality, arterialized blood to the brain; and that the sensorial power should frequently continue to exist after the circulation of the blood has, to all appearance, ceased.

The circulation within the head has several peculiarities. The cerebral arteries have not a cellular

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* Observations on Cholera, by Dr A. T. Christie.

coat; they are reduced to extreme minuteness; and they do not appear to be accompanied by nerves.* The communication between the veins and the sinuses of the dura mater is peculiar, and the sinuses themselves are widely different from veins. The direct course of the blood, however, from the heart to the head, will have considerable effect in preserving entire the cerebral circulation, after that of the trunk and extremities has ceased.

But it is not necessary to speculate further on this point; it is sufficient for the present purpose to state, that notwithstanding the cessation of circulation in the trunk, the sensorial and respiratory powers are nearly perfect. And the fact that, in this disease, the mental functions remain unimpaired till the last moment of life, is very valuable in one point of view. The symptoms of Cholera Asphyxia throughout its course, must be referred to the condition of the circulation. At whatever period of the disease the state of this important function is examined, it is found to be morbidly affected. Even before patients themselves are aware that they have been attacked, the arteries are beating feebly, and the

* Could it be demonstrated that the sympathetic system does not extend its branches to the circulating vessels of the brain, it would be a justifiable conclusion that the cerebral matter is capable of communicating energy to the vessels imbedded in it; and it might in some degree support the idea which I have ventured to propose, that Cholera Asphyxia is to be attributed to a failure in the sympathetic system.

venous circulation is perceptibly obstructed; and at however early a period in the course of the disease venesection is performed, the current of the blood is found to be retarded, and the colour of the fluid is unnaturally dark. If, in such circumstances, we should find every function of the system suspended, we might conclude that the disease arose from a morbid change in the blood itself. But the continuance of the sensorial and respiratory powers, after the failure of the circulation in the trunk and extremities, and the suspension of all the organic functions, is a direct proof that the disease is not to be ascribed to "death of the "blood."

Every character of Cholera authorizes us in concluding, that it arises from failure of a portion of the *nervous system.* When, in consequence of a blow on the head, a man loses all sensorial and voluntary power, while the respiration and circulation remain little affected, no one doubts that it is a systematic portion of his frame which has been suspended, and that the loss of perception and of motion, has arisen from the source of nervous energy to which these belonged having lost its controlling power. In Cholera, the animal heat sinks, secretion fails, and the circulation ceases. Whatever may be the ultimate means by which these important properties of the system are produced, whether chemical, mechanical, or vital, every one will admit, that the combinations which effect them must depend on the nervous system. It has been demon-

strated, that in this disease the sensorial voluntary, and respiratory involuntary nerves, retain their functions. A man on the point of death from Cholera, breathes, and can give expression to his thoughts. We must therefore, in endeavouring to ascertain the source of the disease, look to the sympathetic system of nerves, which we find perfect in those tribes of animals which have no brain, and which is proved by experiments to retain its independence in the higher classes of organized animals, to whom the brain has been superadded. If we refer to the symptoms of Cholera we shall find, that the functions over which I have endeavoured to prove this system to have controul, are those which the disease suspends; and it is particularly worthy of notice, that wherever the branches of the sympathetic system are largely distributed, there the symptoms of the disease are most prominent.*

It now becomes necessary to endeavour to account for the discharges which so frequently become a principal feature in Cholera Asphyxia; and with that view it is proper to premise a few words on the general subject of secretion.

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* It would even appear that the sinking of the eye may be ascribed to the failure of the energy of the sympathetic system, for Dupuy found that the removal of the superior cervical ganglion of the sympathetic nerve in a horse, was immediately followed by sinking of the eye in its socket. "Le 24 Juin, on lui "extirpa le ganglion guttural gauche. Aussitôt après l'opé-"ration, l'œil de ce côté parut plus enfoncé dans l'orbite."—*Journal de Medicine*, T. xxxvii. p. 343.

Secretion, according to Bostock, is to be referred to chemical and mechanical agencies. He says, "if the substances produced are identical with any "of the constituents of the primary fluid, or even "very similar to them, it may appear probable that "the operation is principally mechanical, whereas, "if the secondary substance differs considerably "from any of the constituents of the primary fluid, "we should naturally suppose that it has been pro- "duced by a chemical affinity, or by the combined "effect of chemical and mechanical action."* And he is anxious to throw entirely out of view *nervous agency*, and to avoid using the term *vital principle*. In my mind, little is gained by referring this function, in the more perfect animal, to unknown chemical affinities, or incomprehensible mechanical actions; and until the processes can be referred to such agents, otherwise than by mere conjecture, I think it better to retain the use of an unknown (except by its effects) vital principle. And it is unquestionable, that whatever may be the nature of the ultimate actions from which secretion results, the circles of actions, which are called into operation by each secretion, must be ascribed to the nervous system. Neither mechanical action, nor chemical affinities, will account for the determination of blood to organs at the moment when it is required, or for the suspension of functions under particular circumstances. In truth it would appear, that the

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* Bostock, vol. ii. p. 495.

efforts of the vital energy are often rather to overcome mechanical actions and chemical affinities, than to appropriate them to its own purposes; and so far at least as secretion is concerned, I should be inclined to lay it down as an axiom, that whenever these agents come prominently forward, it is to be ascribed to a failure of the principle of life in the system.

There is another objection to Bostock's account of secretion. He has not, as it appears to me, sufficiently restricted the meaning of the term, but confounded processes, which are not only different when carried on in their proper organs, but, which are different when they take place in the same viscus. He makes secretion and exhalation the same operation. But does it not happen, that, from disease or accident, a secretion may be changed to a mere serous fluid? It is most inconvenient to the pathologist, in such circumstances, to apply the term secretion to both processes. No doubt the word depraved is added, but this only adds to the objection; for "depraved secretion" does not imply that there is a new action, which is the fact, but that the secerning apparatus is still acting, though disordered. The consequence is, that the pathologist is misled; whereas, were it understood that secretion has ceased, and that a new action has taken place, inquiry would be made into the new condition of the system which had led to this change.

This point cannot be better illustrated, than by the two diseases which have received the same name,

Cholera Morbus and Cholera Asphyxia. In the common Cholera Morbus, *secretion* is not at an end: the matters discharged from the stomach and bowels are the gastro-enteric secretions in a vitiated state, and bilious and excrementitious colluvies; the pulse rises, the skin becomes hot and dry, the tongue is furred and parched; every symptom of the disease is referable to the secerning functions of the abdominal viscera, and to irritation, consequent on depraved secretions being thrown into the intestinal canal. How opposite is the condition in Cholera Asphyxia! We have, in this, a disease in which there is a complete suspension of every organic function; and although, as one of its symptoms, it is attended by great intestinal discharges, yet in these there is not a trace of any of the abdominal secretions.

In the former disease there are *depraved secretions,* producing great constitutional derangement. In the latter, there is *suspension of secretion,* resulting from a general disorder. In the first case, the object of the physician is to evacuate crudities, and *correct* disordered actions. In the second, the curative indications are to relieve the system, and to *restore* the function.

Secretion, in the proper acceptation of the term, should be restricted to that change on the blood which is productive of a substance wholly different in its nature and character from the primary fluid, and which previously cannot be detected in it: Whereas I should denominate the disengagement

of any of the component parts of the blood, in an unchanged state, as exudation or exhalation. When a disease fills the cellular membrane with the serous part of the blood, it is not a secretion. When again a sac is filled with pus, it is by secretion. And on the same principle, a discharge of serum into the stomach or bowels is to be regarded, not as a secretion from the mucous membrane, but as an exudation from the capillary vessels. Besides it will be found, that such exudations are not always to be ascribed to arterial action, but may on some occasions result from a remora in the circulation, which, forcing back the venous blood into the capillaries, the more attenuated parts of the blood are by these thrown off on the secreting surfaces. It is at least evident, that when the capillary vessels continue to throw off large quantities of fluid, after the left side of the heart has ceased to supply them with blood, the process can only be accounted for in this way.

The above observations on secretion generally, appeared necessary to render the following explanation of the Cholera discharges intelligible.

The fluids evacuated by the stomach and bowels, during Cholera Asphyxia, are found to be portions of the component parts of the blood. In health we never see such fluids discharged from the abdominal viscera;—they are not gastric or duodenal juice,—they are not bile,—they are not excrementitious matter,—nor are they the mucous secretion of the canal. The Cholera discharge consists of the serum

and fibrin of the blood. But then evacuations go on, and the bowels are filled, after the heart has ceased to act, when the arteries are empty, and when the capillary vessels are no longer supplied with blood by the usual course. The great veins, however, the liver, and the right side of the heart, are gorged with blood; the abdominal veins having no valves, regurgitation takes place, the capillaries are filled by a retrograde course of the blood, and are thus enabled to discharge the more attenuated parts of it. And although I believe that, in these circumstances, there is a deficiency of the nervous energy necessary towards *secretion*, still, as the medullary nerves retain their functions, the action by which this fluid is excreted, will retain the character of life, and will differ from the purely mechanical and chemical changes which take place after death.

The source of nervous energy by which secretion is excited, gives rise to one of the most interesting questions in physiology. When a man has his spine dislocated, and loses power over the portion of his body below the injured part, if he continue to breathe, the secretions go on. When in apoplexy or concussion of the brain, the sensorial power only is suspended, secretion is not destroyed. In acephalous monsters, a very small portion, apparently, of the medulla oblongata, suffices towards the performance of secretion; and we find that some monstrous productions, in which there was not only no appearance of brain, but a very imperfect formation of the

medulla oblongata,* have lived, even for some days, and secreted urine. In all Mr Brodie's experiments, in which the sources of the sensorial and respiratory powers were destroyed, although, by artificially inflating the lungs, he could maintain the circulation of the blood, and produce, apparently, all the changes on that fluid which usually take place within its own vessels, *secretion* was at an end.†

The conclusion to which these facts lead is, that the medullary source of secretion lies between the pons varollii and the beginning of the dorsal vertebræ.

In Cholera, where the failure appears to be in the sympathetic system, secretion is suspended; as

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* Much stress is laid by certain physiologists, who are anxious to lower the importance of the nervous system, on the fact of uterine monsters being formed, in which not only no brain or spinal marrow was found, but little appearance of a nervous system. Without stopping to inquire, whether due examination was made in these cases into the existence of the sympathetic system, I will observe, that, until the powers of the placenta be ascertained, little weight can be given to the evidence afforded by imperfect fœtal productions. The reasoning in the text has reference to animals which can live by breathing.

† The changes which take place on the blood in the lungs, and in the course of the circulation, cannot, I think, be regarded as a secerning process; they certainly do not come within the definition of secretion proposed in the text.

I may observe, that while Mr Brodie found that the loss of the sensorial and respiratory powers put an end to all the usual secretions, *exudation* went on, and the process of inflating the lungs was generally put a stop to, by the air cells becoming obstructed by the exuded fluid.

also happens in experiments with poisons, by which the power which circulates the blood is destroyed.*

It is therefore evident, that the integrity of more than one of the powers of the system is necessary to the function of secretion; and we are justified in concluding, that this process not only requires the preservation of the upper portion of the spinal column, but the vital energy of the sympathetic system.

It is important, before concluding this branch of the subject, to attend to the effect produced by Cholera on the cuticular discharges. We have seen, that perspiration almost invariably makes its appearance in the latter stages of the disease. The Author has never seen a fatal case in which, sooner or later, this symptom has not been present. According to Dr Christie, "profuse perspiration is a "very common symptom of Cholera. It is a curious fact, that there is sometimes profuse perspi- "ration when the pulse at the wrist is extreme- "ly small, or altogether imperceptible. This has "generally been considered as indicative of ex- "treme debility of the cuticular perspiratory ves- "sels. On the other hand, I am inclined to think, "that these vessels have their action very much

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* The destruction of the fifth nerve produces ulceration and sloughing of the eye, membrane of the nose, and in the gums of the side of the face supplied by the destroyed nerve; and the removal of the upper cervical ganglion of the sympathetic in the neck, produces nearly similar results. See Experiments by Dupuy in Leronx's Journal de Medicine, T. xxxvii.

"increased; for were the reverse the case, how "does it happen that, when only a small quantity "of blood flows sluggishly, or in drops, from a large "orifice made in a vein, or even when no blood "can be procured, the cuticular secretion forces "its way through the minute pores of the skin? "It is easily conceivable how debility of the per-"spiratory vessels can occasion increased perspi-"ration, when the superficial arteries which are "immediately behind them act with vigour; but "when these arteries do not contain a sufficient "quantity of blood to enable them to continue "their own action, the only way in which perspi-"ration can be thrown out, is evidently by an in-"creased action of the perspiratory vessels."*

This explanation seems to me to refute itself. The pulse is altogether imperceptible, the heart is beating languidly, "and the arteries, immediately "behind the secreting vessels, have not a sufficient "quantity of blood to enable them to continue "their action." When, in fact, all appearance of arterial blood, colour of the skin, animal heat, &c. is absent, this author supposes that the exhalant arteries have the power of throwing off profuse perspiration. Now to this I cannot assent. On what, in the first place, it may be asked, are the exhalant arteries to act? Even admitting that the capillary arteries have an action independent of dilatation, their action surely must be useless when the arte-

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* Observations, pp. 80, 81.

rial blood is no longer sent to them.* It has been found above, that the fluid which exudes from the inner surface of the intestinal canal, must be supplied by the veins; and if it be admitted, that the capillary vessels in the periphery of the *arterial* system are filled at all, this also must be ascribed to regurgitation. And let it be kept in mind, that late in the disease, when the alarming symptom of profuse cold perspiration makes its appearance, the external veins are invariably gorged, so that their valves will be no hinderance to a retrograde course of any *elected* fluid portion of the blood.

I may again notice the fact, that though the skin is thus throwing off profuse perspiration, vesication cannot be produced. This has been a subject of much wonder. But vesication is the result of inflammation, and inflammation belongs to the *arterial* system; so that under the view here given of Cho-

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* The action in arteries would, I think, be much better expressed by calling it simply *contractility;* the term *muscularity* having led to much bad theory, and, consequently, injurious practice. A muscular power is not only uncalled for, but, with all its attendant liability to spasm, irregular action, &c. would prove highly injurious, by interfering with the circulation in its course; and a spasmodic local affection of an artery might irretrievably suspend a function on which the life of the body, not merely as a whole, but of each individual part, depends. To me it appears as absurd to attribute action to arteries independent of a supply of blood, as it would be to expect a mill-wheel to continue its gyrations after we had turned off the supply of water.

lera, vesication is not to be looked for while the disease lasts.

The Author has thus brought to a conclusion his hypothesis as to the immediate cause of Cholera; but, before proceeding to a review of his inferences, the following case, extracted from the MS. Ceylon Reports, is cited as illustrative, not only of the difficulties which are encountered in the treatment of this disease, but also as amounting, almost to a demonstration, of the correctness of the Author's views, while, at the same time, it shews how they may be rendered practically available.

Extract.—Private Thomas Layton, 19th Regiment.
Æt. 22 years; 3 years in Ceylon.

"Had not previously suffered from disease, when "admitted into hospital labouring under epidemic "Cholera. Says he has been affected with slight "looseness for the last two days; at present, 10 "o'clock A. M. 14th August (1819), complains of "headach, vertigo and faintness, with violent vomit-"ing and purging of watery fluid: the features are "shrunk, and expressive of great anxiety; pulse "small and intermitting, profuse perspiration, skin "moderately hot, tongue clean; has had some spas-"modic twitches in the fingers and toes. Although "the state of collapse was fast coming on, I still con-"sidered that the circulation might be relieved by "venesection; lb. iss. of blood was abstracted from

"two orifices before it ceased to flow. He was "instantly placed on a spirituous vapour bath, took "hydrageri submuriatis gr. xxx. in powder, and se-"veral stimulant antispasmodic draughts, the se-"cond of which was combined with tinct. opii ℥i.

"At 12 o'clock the vomiting and purging still "continued; took another dose of hydr. submur. "gr. xxx. had his abdomen fomented, and rubbed "with ol. terebinthinæ. His head was also shaved, "which, together with his legs and arms, was rub-"bed with a liniment composed of antimonii tar-"taris and ol. commune. At this time, the state "of collapse was completely formed; he tossed his "body and limbs to and fro on the couch: the "vomiting and purging was now relieved, but cold "clammy sweats continued, with spasms in the ex-"tremities, for the space of ten hours, during which "time blisters were applied to the head and thorax; "he was kept warm by the vapour bath, had re-"peated stimulant glysters, and his limbs rubbed "with various strong embrocations.

"Ten o'clock P. M.—Was still in a cold perspi-"ration; *continued perfectly collected*; pulse be-"gan to flutter, and both blisters had vesicated. "From this period the pulse gradually rose, and "by eight o'clock next morning the skin was mo-"derately hot, pulse slow and steady, had not "had a natural evacuation. *15th August*, R. pulv. "rhei. ℈ ij. aquæ cinnam. ℥ ii. Vespere,—Had not "had a stool, but had *made water several times*,

" and slept two hours; is extremely exhausted and " torpid; was allowed some wine, and such food " as he fancied. R. enema purgan.

" *August* 16.—Is still in a state of torpor and " listlessness; pulse steady; no appetite. The " enema brought away some fœtid stools. R. " hydrag. submur. gr. x. ter in die.—Repet. ene- " ma cathart.

" *August* 17.—The stupor and insanity, with " obstinate costiveness, continue; he also com- " plained of pain and fulness of the left side, with " oppression of the breathing. Thirty leeches were " applied to the thorax, and four full dozes of ca- " thartic pills were administered, which produced " some bilious stools; pulse and heat natural.

" *August* 18.—The stupor and *catching in* " *breathing* having increased, he was put into a " warm bath; the former blister being healed, ano- " ther was applied to the thorax, and the catharsis " kept up by a cordial rhubarb mixture."

The case goes on till the 22d August, symptoms and treatment continuing much the same, on which day this is the report:—" Breathing more oppres- " sed; *pulse still regular;* has not had a stool " from the medicine. R. enema purgan. c. ol. " terebinthina ℥ ij. Vespere,—Low muttering de- " lirium came on during this day. He gradually " sunk, and died about three o'clock on the 23d " instant.

" *Sectio Cadaveris Five Hours after Death.*

" On taking off the skull-cap nothing unnatural " appeared on the surface of the dura mater, ex- " cepting a number of veins running over it being " much distended with blood. A great proportion " of the veins likewise on the surface of the brain " were highly turgescent, and some of the smaller " branches contained portions of air intermixed " with blood. The cortical and medullary parts " of the brain were natural in appearance and " consistence, except the latter exhibiting, when " cut across, numerous bloody points. The right " lateral ventricles contained about two drachms " of serous fluid, the left about one and a half " drachms. The penial gland was very firm in " consistence, but natural in colour; there was " nothing remarkable about the other parts of the " encephalon. There was about half an ounce of " serum slightly tinged in the base of the brain. " The medulla spinalis was so firm in texture as to " approach to the consistence of ligament: the " vertebral canal could not be examined in a man- " ner sufficiently satisfactory, for want of proper " instruments; and the only circumstance which I " was capable of noting, was part of the serous " fluid oozing out, which no doubt ran along the " sheath lining the canal from the base of the " brain."* The appearances of the chest and ab-

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* Ceylon Manuscript Reports.

domen are given. In the former there was evidence of the existence of inflammatory action ; in the latter, the viscera had the usual character of disordered circulation consequent on a partial recovery from Cholera.

Now the progress of this case is not only valuable, as illustrative of the nature of Cholera, but it assumes something of the shape of a prolonged experiment, confirmatory of the speculations which, with a view to pathology, I have offered on the most useful subdivisions of the powers of the system. This case farther proves the practical value of the opinions which I have ventured to propound with a view to treatment. So long as the symptoms of the disease had their source in a suspension of the energy of the sympathetic system, the intellect was clear, and, as nothing is said of the respiration, we may conclude that the breathing was not more affected than it sometimes is in Cholera. When that disease was overcome, there was a period of exhaustion, followed next day by symptoms of cerebral congestion. Reaction then apparently takes place within the skull, still complicated however with congestion ; but, while the pulse is natural, the breathing is now becoming affected. Next day the symptoms are more decidedly referable to the origin of the respiratory nerves, and there is "catching "in breathing." It may be added, that a correct notion of what was going on in such a case would have directed attention, in the first instance, to the sympathetic system, in the second to the brain, and

in the third, to the upper portion of the medulla spinalis.

The conclusions and inferences at which I have arrived therefore are,—

1. That there are three powers in the system, viz. the sensorial, respiratory, and sympathetic; and that each of these, on all common occasions, is enabled to perform its functions without the active interference of the others.

2. That the destruction of any one of these powers does not immediately annihilate the other two. (1.) The sensorium may be suspended, and the circulation and respiration continue unimpaired. (2.) The circulation may be supported after the source of respiratory power and the brain have been removed. (3.) The circulation of the body may be stopped, and the sensorium and respiration remain unaffected.

3. That the source of the sensorial and voluntary power is in the cerebrum and cerebellum; that of the respiratory power, in the upper portion of the medulla spinalis; and that of the circulating power, in the ganglionic system of the great sympathetic nerves.

4. That secretion requires the integrity of the upper portion of the spinal column and of the sympathetic system; and that when the power of either of these sources of nervous energy is suspended, any appearance of secretion is fallacious.

5. That secreting surfaces may throw off com-

ponent parts of the blood, after their power of secretion is at an end.

6. That Cholera Asphyxia is a suspension of the power by which the circulation of the blood is carried on.

7. That the fluid which, during a fit of Cholera, is poured into the alimentary canal, and which exudes from the skin, mouth, eyes, and mucous lining of the bronchiæ, is excreted after *secretion* has ceased, when animal heat is no longer evolved, and when arterial action is at an end; and therefore must be regarded as an exudation from the venous capillaries, or if from the arterial capillaries, by their being supplied with blood by regurgitation.

III. ITS MODE OF PROPAGATION.

If we could point out the source of nervous energy, (admitting the foregoing explanation of the disease to be correct), there might be some hope of our becoming acquainted with the remote cause of Cholera Asphyxia. But, in the present state of our knowledge, any speculations on this head would be utterly useless; and it is much easier to prove what does not give rise to this disease, than to give even a plausible guess at what really is its source. It is not therefore the Author's intention to analyze the various and conflicting theories in which medical men have indulged on this subject. But although I have no hope of pointing out the nature of the remote cause of Cholera, the progress

of the disease in India is so interesting, and bears so directly on this section, that a short sketch of its history seems an appropriate introduction to this branch of the inquiry.

There can be no serious doubt, that a disease similar to Cholera, has existed in Hindostan from time immemorial. We find descriptions of Cholera Asphyxia in the works of the earliest European writers on Indian diseases. Bontius, upwards of 200 years ago, in treating of " Cholera Morbus," gives a concise and accurate description of the epidemic of our time. " This disease (he says) is attended " with a weak pulse, difficult respiration, and cold- " ness of the extreme parts; to which are joined " great internal heat, insatiable thirst, perpetual " watching, and restless and incessant tossing of the " body. If, together with these symptoms, a cold and " fœtid sweat should break forth, it is certain that " death is at hand." And there is frequent mention made of what was undoubtedly this disease, by medical officers in the Honourable East India Company's service, in the latter part of the last century; while it would appear that in 1775 it assumed the character of an epidemic in India, and extended itself to the island of the Mauritius. It may therefore be concluded, that the tremendous pestilences, which are so frequently mentioned by native historians as having devastated Indian armies, were the same disease with the modern epidemic Cholera.*

* This disease does not seem to have been confined to India. Dr J. Johnson, in his " Tropical Climates," publishes a letter

On this point, reference may be made to the digest of what was known to the Medical Board at Madras previously to 1817, so ably prepared by Mr Secretary Scott, in "the Report on Epidemic "Cholera, as it appeared in the Presidency of "Fort St George."

In its sporadic form, therefore, European-Indian practitioners were not unacquainted with the disease before its last appearance as an epidemic; when its appalling mortality, and its widely extended ravages, forced it on every one's notice with a character of novelty, which soon led to the general belief that it was a new and unheard-of disease.

The origin and progress of this disease since 1817 is peculiarly interesting, and gives a character to its remote cause, differing from that of any other disease. It appears to have been first heard of by rumour, as prevailing in the upper provinces of Bengal in the beginning of that year, and thence it travelled south, through the northern parts of the

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from Mr J. B. Shepherd, who it appears met with a disease in the Brazils which he calls *Mort de Chien*, and which, from the success of blood-letting in the treatment of it, I have little doubt must have been the Cholera Asphyxia.

Sydenham appears to have been acquainted with the disease; and it is not impossible that the English "Sweating Sickness" was similar in character to the Indian epidemic.

More recently, in 1829, some cases resembling Cholera Asphyxia, seem to have made their appearance in a school at Clapham.

Bengal and Bombay territories, on a progressive line of operation, extending across the whole of India; and from the time that it reached the Peninsula, the regularity of its progress becomes very remarkable. Thus, it appeared at Ongole on the 14th of August 1818, in north lat. 15° 30′, and long. 80° east; and at Dharwar 15° 25′ north lat. and 75° of east long. on the 13th of the same month, (August). It appeared in Soonda, in 14° 50′ N. and 74° E., in the beginning of September; at Hurryhur in 14° 30′ N. and 76° E., on the 12th September; and at Nellore, 14° 20′ N. and 80° 25′ E., on the 20th September. It appeared at Madras, 13° 5′ N. and 80° 25′ E., on the 8th October; and at Bangalore, which is 3000 feet above the level of Madras, in lat. 12° 57′ N. and 77° 46′ E., on the 22d of October. And as we approach Cape Comorin, on the extreme south point of India, we find it coming down one coast almost stage for stage with its progress on the other side.*

We thus find the disease travelling from north to south, with unaccountable regularity; appearing in the line of 20° of northern latitude in the beginning of 1818, and reaching 8° north latitude on the 1st of January 1819; holding its course, seemingly uninterrupted by winds, seasons, or climate; appearing at Dharwar on the 13th of August, in the height of the rains, when the thermometer seldom rises above 75° of Fahrenheit in the hottest

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* Vide Map affixed to Madras Report, and the Report.

part of the day; and at Ongole in the same latitude, but distant 5° of longitude, in the dry season, when the thermometer varies from 95° to 105°, within a few hours of the time at which it broke out at Dharwar. In the progress just referred to, far from being assisted by winds, the disease must have frequently travelled in direct opposition to their currents, and seems never to have been retarded or advanced by their direction.

Though the general progress of the epidemic was thus regular from north to south, the disease did not appear regularly at every town in its course. It often seemed to pass over particular stations, breaking out at distant points to the south of them, and, perhaps after three weeks or a month, it would return on the place which had thus apparently escaped the scourge. It frequently existed in only one part of a district, city, or camp, while the whole neighbourhood was free from the disease; and there are some favoured places which have never been known to suffer from its ravages.

I have known the disease to prevail for several weeks at a village in the southern Mahratta country, within a few miles of the principal station in the district, and then leave that division of the country entirely; or, perhaps, cases would occur at some distant point. In travelling in circuit with the Judge of that district, I have found the disease prevailing destructively in a small and secluded village, while no cases were reported from any other part of the district.

It oftener than once occurred, when the disease

attacked the battalion under my charge at Dharwar, in the southern Mahratta country, that it was confined to one particular subdivision of the lines of the regiment, from which only cases were brought into hospital during that particular round of the disease; and a similar phenomenon took place in the town of Dharwar, certain streets only suffering from the disease at one time.

Other instances of still a more limited prevalence of the disease occurred at particular places; for example, in a camp, only one tent would appear to have been within the sphere of the remote cause of the disease, and almost every person who had slept in that tent would be attacked during the night. An instance occurred to a friend of mine, in which the disease seemed to be caught in a very remarkable manner. The division of the army to which this gentleman was attached, had suffered severely from Cholera. One evening, when the disease appeared to have subsided, he, in a stroll with a friend, met a lady of their acquaintance on horseback, who stopped and conversed with them, and in the course of that night, each of these individuals was attacked with Cholera.

We have thus a disease, which, on a great scale, travelled with remarkable regularity over the whole face of the Continent of India, but with considerable eccentricity at particular stages of its progress. We find this progress uninfluenced by winds, climate, or temperature, while, at the same time, we have a remarkable anomaly, which will be adverted

to more particularly in the succeeding Chapter, viz. that the malign influence seemed to be subject to most extraordinary and inexplicable anomalies; in so much that the disease was occasionally found raging in one quarter of a city or camp, while, notwithstanding the most unrestrained intercourse between the infected and the healthy quarter, no case occurred beyond the *territorial* limits to which, for the time, the pestilence seemed to have confined itself.

Ritter found, that while positive electricity seemed to augment the vital powers, negative electricity diminished them; the former increased the pulse, the latter lowered it; the former caused the sensation of heat, the latter of cold. The Author has found the distinctive character of Cholera Asphyxia to be, the sudden deprivation of the nervous energy of the sympathetic system; and, without laying much stress on the supposition, it is not impossible that the source of the disease is to be found in some sudden change, in the electric or galvanic condition of the surface of the earth. This suggestion is not made with the intention of supporting the hypothesis, that galvanism is identical with nervous energy; but unquestionably that agent is so intimately connected with every portion of the creation, that any sudden withdrawal of it from the animal system, might not improbably produce such a disease as Cholera.

The result, however, at which we arrive after all is, that we know absolutely nothing of the remote

cause of this disease. This is the conclusion to which most writers have come; and although the phenomena alluded to may lay the foundation of much curious and interesting speculation, it is of infinitely greater consequence, in the present state of our information, to confine our inquiries to the practical questions which have not been lost sight of by the framers of the plan of the present Essay. I shall proceed, therefore, to the fourth of the appointed heads.

IV. A DEMONSTRATION, BY THE MEANS OF EXACT AND FAITHFUL EXPERIMENTS, OF ITS BEING COMMUNICABLE FROM ONE INDIVIDUAL TO ANOTHER, IF SUCH BE THE FACT.

There is no question connected with the doctrine of diseases of more importance, than that of the contagious or non-contagious nature of a dangerous malady. In a particular manner is this true in regard to a disease like Cholera Asphyxia, one attack of which, so far from being a protection against a second, seems to render the constitution more susceptible of the disease. Were it therefore ascertained, that contagion is the cause of the spreading of Cholera, measures might be taken for arresting its progress, and we might have some hope of staying one of the most formidable scourges which has ever afflicted mankind. Hence there is every reason for endeavouring to ascertain the fact, with a view to

the prevention of the disease. But I confess it is with no such hope that I enter on this inquiry.

My own opinion, not hastily adopted, is, that Cholera has not, within the tropics, proved itself contagious or infectious; and I trust, that in traversing Europe, as there is reason to dread it is now about to do, this pestilence will not be found so far to have changed its nature as to render our intertropical experience on this head useless. That experience appears, I think, to justify me in saying, that the question truly is, whether we shall maintain a speculative controversy, one effect of which must be to make pest-houses of our hospitals and of the dwellings of the sick, or be guided by the result of experience, and thus be enabled to secure to those suffering under this frightful disease, the sick-bed attentions of their friends, or the assistance of hospital attendants, unrestrained by the paralysing effects of personal fear for their own lives.

The following enumeration embraces the points of chief importance in this deeply interesting inquiry.

1. The nature of the disease.

2. The march, as it may be called, or progress of this disease on the great field of its ravages.

3. Its progress in particular districts.

4. The manner in which it prevailed in a camp or city.

5. Its appearance in a sporadic form.

6. Whether those cases which have been consi-

dered the consequence of contagion, may not be otherwise accounted for? And,

7. Whether there is conclusive evidence, (so far as negative evidence can be so), that the disease is *not* contagious?

1. The subject of contagion, applying the term to that power by which a disease is enabled to propagate itself, is one of peculiar delicacy. For, in addition to its importance in a medical point of view, it is a question in which the prejudices, fears, and safety of the inhabitants of every civilized country, are concerned. The nature of this work does not admit of the general doctrine of contagion being fully discussed. It appears necessary, however, to say a few words on this subject.

It is unquestionable that many diseases are of a nature to extend themselves by contagion, in the sense to which it is here employed. But even the most decidedly contagious affection seems to require, towards its propagation, the aid of agents over which it has itself no controul. Thus there must not only be predisposed subjects, but, there seems to be requisite a particular condition of season or climate, to invest a contagious malady with full activity. This single fact is one of the chief causes of the difficulty of reasoning on this subject; for the suspension of a disease may not be owing to its non-contagious nature, but to the absence of a soil on which it may germinate.

The diseases which seem best entitled to be considered contagious, are eruptive fevers—fevers hav-

ing a putrid tendency, and those attended by cynache. Ophthalmic affections seem also sometimes to become contagious; and many cutaneous complaints are capable of being communicated from one individual to another. Hydrophobia is the only affection, having its seat in the nervous system, which is capable of propagating itself; but that only by inoculation. Those poisons which can be introduced by the same means, to the injury of the system, are not to be regarded as productive of disease.

It appears to be a law of contagion, that the infection shall not immediately manifest itself; and it is, therefore, generally some days after exposure to contagion, before the disease becomes apparent.

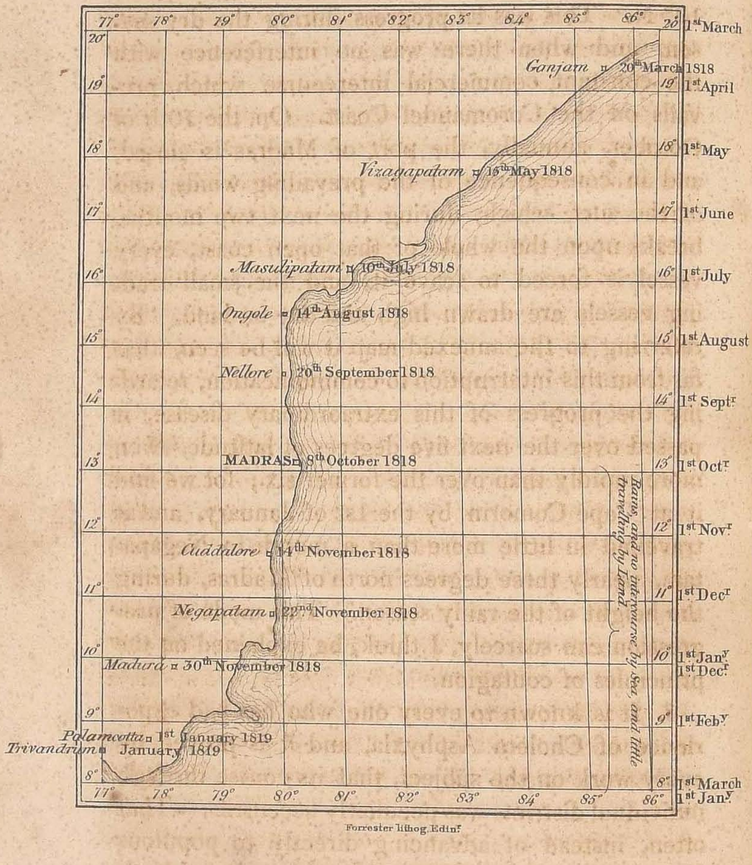
We have seen that Cholera assumes the character of a nervous failure, and that it attacks those predisposed to it, immediately on their coming within the influence of its remote cause; that its symptoms are like those produced by certain poisons; and that recovery from it is as instantaneous as the restoration of the sensorial powers after suspended animation. It has not therefore, in its mode of attack, in its course, or in its termination, any of the characters of those diseases which experience enables us to call contagious.

2. The disease extended itself over countries differing entirely from each other in climate and position; having no regard to seasons. This, at first sight, may appear to support the opinion, that the disease is contagious or infectious. And such would be the legitimate conclusion, had Cho-

lera advanced more rapidly on great thoroughfares, or on the sea-coast, where unrestricted intercourse prevailed, than in the interior of the country, and where little or no communication existed. But, instead of having been thus propelled in one direction, and retarded in another, we find the disease travelling with an equal pace over the whole surface of India, extending, on its way south, over eight or ten degrees of longitude, and reaching the least frequented spots and most secluded villages.

It may be said, that we are not to expect that a disease, which, like Cholera, at once arrests the wayfaring traveller, is to pursue its course rapidly on land. But this objection to my argument will not hold on a sea-coast, where small trading vessels carry on uninterrupted traffic, for a great portion of the year, and where no quarantine laws exist. In such circumstances, a contagious disease would inevitably be speedily propagated along the sea-shores. And hence, instead of Cholera reaching the seaport of Madras, simultaneously with its appearance in parallel latitudes in the interior, some of the many trading vessels must have carried it speedily, from the tainted districts, to the seat of the Presidency, had the disease been capable of being conveyed by man or merchandize. The progress of Cholera down the Peninsula of India, when it visited that country in 1818, is so instructive, that I have thought it advisable to abridge the map published by Mr Scott in his Report, already referred to. From this sketch it will be perceived,

p. 81



Forrester lithog. Edinr

that Cholera, as an epidemic, was in 19° N. on the 10th March 1818, that it travelled regularly at the rate of about one degree of latitude a month, and that it reached Madras on the 8th October in 13° N. This was its progress during the dry season, and when there was no interference with the constant commercial intercourse which prevails on the Coromandel Coast. On the 10th of October, annually, the port of Madras is closed, and in consequence of the prevailing winds, and of the surf, which, during the next two months, breaks upon the whole of that open coast, every vessel is forced to leave it, and the small trading vessels are drawn high and dry on land. By referring to the annexed map it will be seen, that far from this interruption to communication, retarding the progress of this extraordinary disease, it passed over the next five degrees of latitude, even more rapidly than over the former six; for we find it at Cape Comorin by the 1st of January, and it travelled in little more than a month to Negapatam, nearly three degrees north of Madras, during the height of the rainy season. This mode of progression can scarcely, I think, be explained on the principles of contagion.

3. It is known to every one who has had experience of Cholera Asphyxia, and it is proved by every work on the subject, that its course through individual districts was peculiarly eccentric:—That often, instead of advancing directly to populous places, when prevailing on the principal road lead-

ing to them, it would "take a complete circuit "round the village, and, leaving it untouched, pass "on, as if it were about wholly to depart from the "district: then, after a lapse of weeks, or even "months, it would suddenly return, and, scarcely "reappearing in the parts which had already un-"dergone its ravages, would nearly depopulate the "spot that had so lately congratulated itself on its "escape."* Or it would sometimes nearly depopulate small villages near a principal station, before it made its appearance there. Thus, during a period of upwards of five years (from 1819 to 1824), in which I had medical charge of the civil and political establishment in the southern Mahratta provinces, and was, for a great part of the time, in medical charge of the garrison of Dharwar, Cholera, in an epidemic form, appeared yearly in that division, in the months of April, May, and June; and it only broke out at Dharwar, the principal civil station, in the years 1820 and 1821. In the latter of these years it had, as stated in my official report, "prevailed for the last two weeks in seve-"ral surrounding villages of from six to twelve "miles distance, and has in some of them swept "off many of the inhabitants;" being thus for many days within sight of the capital of the district, before it reached it. In 1824, although the disease again prevailed in the immediate neigh-

* Bombay Report, p. vi.

bourhood, it did not appear in the town or jail of Dharwar.

These examples of the habits of the disease appear to me inconsistent with the notion of its being possessed of a contagious quality. For in a country where, as in India, no restrictive measures are adopted, a principal city in a district could hardly by possibility escape a contagious epidemic, when raging in its neighbourhood. An infectious disease, one attack of which affords no protection against another, which travels in the face of the wind, and prevails in all seasons, would spread in every direction from any point at which it had commenced its ravages; and we should not expect it to disappear until it had attacked every individual liable to suffer from it, and exposed to its pestilential influence.

The course pursued by the Cholera on its appearance in Russia, does not appear to have differed very much from its progress in India. It did not reach the Imperial territories when it was known to prevail on the great roads leading to Orenburg, where it at last broke out. And when it did commence its ravages at that place, there seems to be no reason to believe that it prevailed within reach. It does not appear to have spread directly; nor, although its general course was north-west, does it seem to have held that course undeviatingly; but at one time it capriciously passed over 50 or 60 miles, and then retrograded on the country which had thus appeared to have escaped; at other times, cer-

tain places appeared happily to be exempt, but, five or six weeks after it had left the country, it broke out anew in those very places which had had reason to congratulate themselves on their escape.*

4. The annals of Cholera prove, that when it made its appearance in a camp or a city, far from extending to every habitation, it was almost invariably confined to particular portions of even the most populous places. Sometimes, in an army for instance, one or two regiments encamped together, or separated by other corps, were the only sufferers in an attack of the epidemic; one division, or even one street only of a town, had the disease existing in it; nay, its prevalence has been known to be limited to one side of a market-place. Removing a camp a few miles has frequently put an entire and immediate stop to the occurrence of new cases; and when the disease prevailed destructively in a village, the natives often got rid of it by deserting their houses for a time, though in doing so they necessarily exposed themselves to many discomforts, which, cæteris paribus, we should be inclined to consider exciting causes of an infectious or contagious epidemic. The bare statement of these facts affords a strong argument against the doctrine of contagion or infection, as a source of Cholera Asphyxia.

5. It is possible that, under peculiar circum-

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* *Vide* Edinburgh Medical and Surgical Journal, No. cvii.

stances, a sporadic case of a contagious disease might occur without the disease spreading; but we could scarcely hope that such immunity would be of frequent occurrence, where no steps were taken to prevent such an event. Yet it is well known that insulated cases of Cholera are of constant occurrence in India, and that it is not uncommon for several individuals to be simultaneously attacked, in a particular quarter of a city or camp, without any subsequent spreading of the disease.

It is absurd to endeavour to draw a line of distinction between a *sporadic* and an *epidemic* case of Cholera; the disease is the same in symptoms, the same in its course, and the same in its results. No doubt this argument presents a difficulty, to whatever we ascribe the disease; for it may be said that the want of predisposed subjects prevents its dispersion. But we have a sufficient cause to produce one or more cases, and why trammel ourselves with an inconvenient, and to the sick most injurious, probability, when there are so many facts in direct opposition to it?

6. It is no proof that a disease is contagious, to say that all the inhabitants in one house have suffered from it; or that it has attacked the attendants of the sick. This is a disease running so rapid a course, and which, on its accession, so immediately deprives those affected with it of the power of locomotion, that it cannot be carried by individuals to any great distance: it suddenly appears in a particular part of a city or camp, attack-

ing several individuals within a few hours of each other, while it does not exist anywhere else in the neighbourhood. We must suppose that the remote cause, whatever that may be, prevails at the particular spot thus affected. And moreover, it is to be taken into account, that, in a house in which a father, son or mother, is carried off by so rapidly fatal a disease, there will be much distress of mind and fatigue of body to every member of the family. Here then, in one house, not only is there the remote cause of Cholera, but undoubted predisposing causes, superadded, perhaps, to a family constitutional tendency to suffer from the disease. Under such circumstances, surely, we have sufficient to account for more than one of a family falling victims to the Cholera, without calling in the agency of a problematical cause for its extending itself to various members of the household.

It is supposed that medical men have suffered more than others of their rank from Cholera. We should certainly expect this to be the fact, for whatever may be the remote cause of the disease, it is admitted by all, that fatigue of mind and body is a powerfully *predisposing cause.* So that instead of receiving the preponderance of fatal cases (if such be the fact) of this disease among medical men, as a proof of its contagious nature, the very few deaths from Cholera among the professional men who have seen much of the disease, ought to be regarded as evidence on the other side. I am persuaded, indeed, that the almost universal belief of Indian

practitioners that the disease is *not* contagious, results from a conviction, which every medical man, who has done his duty to Cholera patients, must feel, that had the disease been communicable from one individual to another, he could scarcely by possibility have escaped.

In my apprehension, indeed, the wonder rather is, that so few of the medical officers belonging to the Madras Presidency have died of Cholera.* Much, I think, may be ascribed to Cholera patients having been, almost invariably, brought into hospitals, frequently at a distance from their own habitations; and we have seen that the remote

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* During the years from 1818 to 1822 inclusive, the numerical strength of the European troops in the Madras Presidency was kept up at 10,000 men. In the course of those five years 3664 cases of Cholera occurred in this force, of which 695 were fatal, or at the rate, per annum, of one casualty from Cholera to every 72 men. During the same period, the Madras medical establishment was kept up at 200 commissioned officers. In those five years, 33 medical officers were known to have had attacks of Cholera, of whom 13 died, that is, one in 77 per annum.—See Madras Report.

Of course, under ordinary circumstances, the risks run by officers should not be brought into comparison with the dangerous exposure to the predisposing causes of an epidemic disease, arising from the habits of European soldiers in India. But medical men have more than their own share of exposure to the remote cause of Cholera. For, to say nothing of the effects of the fatigue and anxiety to which they are exposed during the presence of the disease, among those immediately under their charge, they are liable to be detached whenever the disease breaks out within reach of them.

cause of the disease is always, for the time being, limited to particular localities. Hence it has been found, that, notwithstanding the severest duties to the surgeons and their assistants, regular and extra, the most crowded hospitals, where situated beyond the territorial range of the disease, have not afforded a single new case. This point will be fully illustrated under the next head.

The legitimate conclusion seems to be, that Cholera has not been influenced in its progress by contagion; having, on the contrary, been frequently confined to one portion or quarter of a populous camp or city, although no means were taken to prevent its extending over the whole dense population of either: That it has appeared sporadically without spreading: And that it is possible to account for its being destructive in one particular house or quarter, without the aid of contagion.

But it has been said to accompany troops, in marching into a district where it had not previously prevailed, and into which it has thus been introduced. This statement is so much at variance with the well ascertained habits of the disease, that it would require the most minute inquiry, and unquestionable evidence, to entitle it to credit. It has been repeatedly ascertained, that Cholera patients may be carried into hospitals crowded with patients labouring under other diseases, without these, or numerous hospital attendants, having the disease communicated to them. Yet it is asserted,

that a regiment, travelling at the rate of six or ten miles a-day, has carried the disease along with it a hundred miles or more, communicating it to the inhabitants as it passed on! We have seen that a camp, by shifting ground a short distance, has put a stop to the ravages of the disease. And is it to be believed, that a regiment cannot get rid of it, with no cause but contagion for its continuance, by ten or twenty marches? I conceive, that this supposed proof of a contagious quality in Cholera may be otherwise accounted for. When travelling on circuit, I have found the disease prevailing in a district, before any report had been made of the fact, notwithstanding the most positive orders on the subject; and I am persuaded, that were any of the instances, adduced in support of the statement under consideration, strictly inquired into, it would be found, that the usual apathy of the natives of India had prevented their noticing the existence of the disease, until the fact was brought prominently forward by the presence of Europeans. It should also be borne in mind, that Cholera Asphyxia is not a new disease to these natives, but seems to be in many places almost endemical; whilst it is well known, that strangers, in such circumstances, become more obnoxious to the disease than the inhabitants of the country. Moreover, travellers have, superadded to the remote causes of the disease, fatigue and road discomforts, which are not trifling in a country where there are neither inns nor carriages.

The following extract from the Journal of my

first journey in India, is illustrative of some of the peculiarities, in this disease, to which I have adverted. In July 1819 I marched from Madras in medical charge of a large party of young officers, who had just arrived in India, and who were on their way to join regiments in the interior of the country. There was also a detachment of Sepoys, and the usual numerous attendants and camp-followers of such a party in India. The Cholera prevailed at Madras when we left it. Until the fifth day's march, (50 miles from Madras), no cases of the disease occurred. On that day several of the party were attacked on the line of march; and, during the next three stages, we continued to have additional cases. Cholera prevailed in the country through which we were passing. In consultation with the commanding officer of the detachment, it was determined that we should endeavour to leave the disease behind us; and as we were informed that the country beyond the Ghauts was free of it, we marched without a halt, until we reached the high table land of Mysore. The consequence was, that we left the disease at Vellore, 87 miles from Madras, and we had none of it until we had marched 70 miles farther, (7 stages), when we again found it at one of our appointed places of encampment. But our camp was, in consequence, pushed on a few miles, and only one case, a fatal one, occurred in the detachment. The man was attacked on the line of march. We again left the disease, and were free from it during the next 115 miles of travelling. We

then had it during three stages, and found many villages deserted. We once more left it, and reached our journey's end, 260 miles farther, without again meeting it. Thus, in a journey of 560 miles, this detachment was exposed to, and left the disease behind it, four different times; and on none of those occasions did a single case occur beyond the tainted spots.

7. It has been remarked by many practitioners, that although they had brought Cholera patients into crowded wards of hospitals, no case of the disease occurred among the sick previously in hospital, or among the hospital attendants. My own experience enables me fully to confirm this. The military hospital at Dharwar, an oblong apartment of about 90 feet by 20, was within the fort, and the lines of the garrison were about a mile distant, outside of the walls of the fort. On two different occasions, (in 1820 and 1821), when the disease prevailed epidemically among the troops of that station, while I was in medical charge of the garrison, but while no cases had occurred in the fort within which the hospital was situated, the patients were brought at once from their quarters to the hospital, which on each occasion was crowded with sick labouring under other disorders. No attempt was made to separate the Cholera patients from the others. On one of these occasions, no case of Cholera occurred within the hospital; on the other, one of the sick was attacked, but he was a convalescent sepoy who had not been prevented from leaving the fort during

the day. The disease on each of those occasions was confined to a particular sub-division of the lines, and none of those residing within the fort were attacked.

Here then there were from 20 to 30 cases of Cholera admitted, in the course of a few days, into the same apartment with from forty to fifty patients suffering from other ailments, yet not a single instance, to countenance the notion of contagion, occurred.

Mr Scott says, "The most striking instances of
" immunity from the disease, under the most inti-
" mate personal intercourse, will be found recorded
" in the original reports. In the hospital of the
" Royal Regiment, only one individual out of one
" hundred and one attendants was attacked with
" the disease. In that of the 11th Native Regi-
" ment at Vizianagram, as recited by Mr M'An-
" drew, p. 33. not one was seized, although their
" numbers would seem to have been great. In the
" hospitals at Trichinopoly no attendants were
" taken ill. Many medical officers appear to have
" slept in their hospitals, without suffering any bad
" consequences. At St Thomas' Mount, where a
" general receiving hospital for patients with the
" Cholera was established, and where the numerous
" attendants were people not at all accustomed to
" hospitals, not one of them was taken ill; yet it
" was not uncommon to see them using the bed-
" clothes of patients who had just recovered or died.
" The same observation applies to the numerous

" receiving hospitals at Madras. Mr Acting-sur-
" geon Gibson, on reporting on a late attack (April
" 1823), experienced by the 69th Regiment at
" Wallajahbad, observes, I had 92 admissions, and
" increased the establishment of servants to double:
" I lived in the hospital, amidst the sick, day and
" night; and yet neither I myself nor any of the ser-
" vants got the disease; but the hospital serjeant's
" wife, living in a retired room, not near any dis-
" ease, had a severe attack."*

In Russia, under equally favourable circumstances, hospitals seem to have enjoyed a similar immunity; thus, " as is mentioned by a Staff Physician,
" Dr Smirnov, during two months while the dis-
" ease prevailed at Orenburg, and 299 patients
" were admitted with Cholera into the military hos-
" pital, the personal attendants on the sick remain-
" ed entirely exempt from the disease. They con-
" sisted of one hospital assistant, six pupils, as many
" Baschkir lads, and fourteen hospital servants,—in
" all 27; and their duties were to perform blood-
" lettings, apply leeches, poultices, and frictions,
" and administer baths and the like, so that they
" were compelled to be constantly breathing the
" exhalations from the bodies and clothes of the
" sick, as well as to touch and handle them. Be-
" sides, the same immunity was enjoyed by certain
" officers and subalterns who lived in this hospital,
" and were in the sick wards once a-day, besides

* Madras Report, p. 1.

"being at other times in constant communication
"with the hospital-assistant and the pupils. Far-
"ther, the washerwomen of the hospital likewise
"escaped,—a class of individuals, who, it is well
"known, are extremely apt to suffer from contagi-
"ous diseases. One only was attacked with Cho-
"lera; but she washed only the clothes of the offi-
"cers, none of whom had been affected before she
"took ill. Lastly, Dr Smirnov, and his colleague Dr
"Sokolov, were in constant attendance on the pa-
"tients affected with Cholera, but did not suffer."*

Even supposing, therefore, that an attack of Cholera Asphyxia might, in some instances, be accounted for on the doctrine of contagion, there are so many other occasions in which it is evident that no such quality of the disease can have existed, that the theory of contagion is only to be supported by admitting controvertible facts, and at best rare and otherwise explicable exceptions, in opposition to the ordinary phenomena of the disease; and also in opposition to the unanimous impression of those medical men in India, who have been most familiar with the disease.

There is one point on which a few words are required before concluding this portion of the treatise. Every hospital surgeon is aware, how seriously important it is to himself, and how vital a matter it is to the sick, that the subordinate hospital attendants

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* Edinburgh Medical and Surgical Journal, vol. xxxvi. p. 132.

should not only be efficient, but willing to perform their duties. A high-minded gentleman, notwithstanding a belief in contagion, may boldly do his duty to a patient labouring under a pestilential malady. But we are not to expect the same devotion, under similar circumstances, from an ignorant nurse or half-educated dresser. It requires much more nerve than persons of that class usually possess, to enable them to brave death in such a shape, from a sense of duty: And to those who, like the Author, have suffered from the effects, on hospital servants, of the mere mooting of the point, it becomes a question, whether, for all practical purposes, it were not better at once to drop the subject, than by countenancing the belief, while so questionable, to inflict a fatal injury on the unhappy sufferers; unless, indeed, it shall be ascertained beyond a doubt, that the progress of the disease may be stayed by sanitary cordons, or quarantine restrictions.

I have as yet restricted myself to the discussion of the question of contagion in its professional bearings. But the subject has assumed an importance to every Government in Europe, which renders it imperative on the Author of such a treatise as this, to say a few words on quarantine restrictions and sanitary cordons.

The disease is evidently one which does not lurk in the constitution. Its cause, like the venom of a viper, or a narcotic poison, produces immediate effects. Thus, a man lands from a sea voyage

at a port where the Cholera exists, is attacked with the disease, and, before he has been twelve hours exposed to its cause, has fallen a victim to it: Or, as is mentioned at page 90, a traveller on a journey passes over a spot of ground on which the *cause* of the disease prevails; he falls down, as if exposed to the pestilential influence of the fabled Upas tree, and, if carried to the end of his stage, is found to be beyond the reach of art. The disease, therefore, is one which loses no time in manifesting itself; so that, even if admitted to be contagious, a very short quarantine would suffice, and commercial, social, and political intercourse, would suffer but little inconvenience.

I have said nothing of quarantine on goods, because I have never heard or known of any evidence to prove that the disease can be so conveyed. When washerwomen wash with safety the clothes of Cholera patients, and servants lie down with impunity in the beds which have just been cleared of the dead bodies, or use the bed-clothes of those who have died, we shall scarcely have reason to fear the introduction of the disease into a country by tallow, hemp, or ox hides.

A restrictive cordon assumes a different character. The effects to the sick, of a dread of contagion on the minds of their attendants, has been already hinted at. But its staunchest supporter admits, that contagion is but one of the causes of Cholera; while it must be evident to every one, that the remote cause of the disease pervades a

portion of country, where it prevails for a time, and that all living, or coming within the bounds thus, for the time, marked out by the disease, are apt to be attacked. In a country free from sanitary restrictions, we have seen the inhabitants of infected spots find safety in flight. How different would their condition have been, had they been strictly hemmed in within the tainted limits. There cannot be conceived a situation more full of horror than a town, the site of which is infected with Cholera, and the inhabitants shut up in it.

The tendency, therefore, of admitting at once the existence of contagion in Cholera, in the present undecided state of the question, is injurious to trade, fatal to the sick, and fraught with melancholy forebodings to those who may be exposed to a visitation of the disease.

V. AN INDICATION OF MEASURES TO BE ADOPTED FOR SELF-PRESERVATION AGAINST ITS CONTAGION, SHOULD THE DISEASE PROVE CONTAGIOUS.

Having, after much experience of the disease, and the most serious consideration, arrived at the conclusion that Cholera Asphyxia is not contagious; and having in the preceding Chapter fully discussed the subject—this section of the inquiry might seem superfluous. But although, in my opinion, the remote cause of Cholera is not within our reach; and although I am convinced that the dis-

ease is not communicable from man to man, still there are some of the exciting causes which are not beyond human controul, and which are well worthy of consideration in a practical inquiry into the nature and treatment of the disease. This seems to be the proper place for considering these precautionary measures.

1. Whatever has a tendency to depress the general powers of life, may be regarded as an exciting cause of a disease which has its source in a failure of one of the principal powers of the system; such as fatigue, cold, hunger, a debauch, mental anxiety, depressing passions, &c.

2. Every thing likely to produce chylopoetic derangements—unwholesome food, unripe fruit, or indulgence to excess in fruit or acescent vegetables—are to be dreaded, when the remote cause of a disease is present, which so immediately destroys the source of all the abdominal functions.

3. Whatever is likely to determine the fluids of the body to the alimentary canal, seems to act as an exciting cause of Cholera.

1. When Cholera prevails in a district, or on a line of country, through which it is necessary to march, it is of great consequence to avoid as much as possible all exposure to fatigue, long marches, harassing night watching, &c. Cold is also to be avoided, particularly while asleep. In a hot climate, it is extremely difficult to adhere to this rule; and the well known manner in which the disease frequently makes its attack in India, illus-

trates the fact. It often happens, that the heat of the early part of the night renders sleeping within doors impossible. The couch, therefore, is placed where there is the best chance of obtaining a breath of air, viz. between open doors, in the verandah, or even in the open air; at last a delightful cool breeze springs up, and the wearied Indian drops asleep. Towards morning he awakes chilled, or perhaps has an alvine call; by and by he becomes sick, and by seven or eight o'clock he is found to be in the third stage of Cholera. No doubt many sleep, thus exposed, without catching the disease; but the frequency with which such exposure is followed by an attack of the disease, renders it evident that it is dangerous, when superadded to the remote cause. Exposure to cool night winds, therefore, during the prevalence of Cholera, however agreeable, should be carefully avoided.

Moderately warm clothing, even within the tropics, is also of importance, with a view to the prevention of disease; and the Author has been in the habit, even in the hottest weather, both by precept and example, of recommending the use of flannel next the skin. It is the best means of regulating the warmth of the body, and of preventing sudden and injurious chills.

It is unnecessary to enlarge on the depressing effects consequent on a debauch. All who have seen the disease, are aware how frequently an attack of it has succeeded intoxication. Indeed, the

common excuse among the soldiery, for not applying for medical aid in time, is, that they thought they were only suffering from the effects of the excess of the previous evening.

The minds of all exposed to the remote cause of Cholera, should be as much supported as possible. In a particular manner it is necessary, that those in attendance on sick relations should be saved, if possible, from fatigue, that bodily lassitude may not be added to mental distress; and every attempt should be made to remove any alarm as to the contagious nature of the disease. It is a good rule, to avoid making the disease, when prevalent, a subject of conversation; and in camps, on such occasions, it is better to conduct funerals without the usual noisy ceremonial.

Little need be said of the injurious effects of hunger; but it may be observed, that it is dangerous, during the prevalence of Cholera, to march or take severe exercise before breakfast, with an empty stomach.

Residents in tropical climates, when unavoidably exposed to rain, ought to take the first opportunity of changing their dress.

2. It is usual with the natives of India, to ascribe an attack of Cholera to their having taken an early meal of cold rice; and it has been already observed, that, during an epidemic visitation of Cholera Asphyxia, there is a general feeling of insecurity, it may be said, in the abdominal viscera. This is very likely, even if the result of miasma, to be in-

creased by the helpless condition in which human beings feel themselves, when exposed to a danger which is beyond their comprehension and controul.* The impression thus made on those exposed to the disease, therefore, added to the character of the symptoms, renders it advisable that much attention should be paid to the digestive organs, when Cholera is prevalent. The aliment should be of easy digestion, generous and nutritive; those accustomed to live well, should not be stinted of any of their usual luxuries; long fasts and subsequent heavy meals should be avoided; and fruit, and all vegetable matter likely to produce acidity, to disagree with the stomach, or to derange the bowels, must be prohibited.

3. It is so much the fashion in these times, for individuals to dose themselves with medicine, that many are apt to resort, for the relief of the uncom-

* I may here insert the observations, on this subject, of a highly valued friend of mine, now no more, who had seen much of Cholera, having himself suffered from two attacks of it, and whose treatment of himself under the latter of these attacks, I shall have occasion to refer to in a subsequent part of this treatise. He says, "Indigestion, I think, is a prevailing complaint with "every one whenever Cholera is common; and the greater the "degree of the disordered state of the stomach that exists, the "more likely is the person to be affected by the epidemic, and "the less likely to recover. I think medical men, from the "particular fatigue of mind or body that they undergo during "the prevalence of an attack, are more liable to the disease "than other persons of a similar rank of life."—*Private Letter from J. Cox, Esq. Assistant Surgeon, H. E. I. C. S.*

fortable feelings which arise during the prevalence of Cholera, to some favourite purgative; and innumerable instances have occurred, in which the invasion of the disease seemed the result of an overdose of medicine. I agree, therefore, with those who disapprove of powerful doses of medicine, while Cholera is prevalent; in particular, such cathartics as produce watery evacuations are to be avoided. At the same time, the bowels should be most carefully regulated, and if medicine be necessary, warm purgatives, in moderate doses, should be prescribed. It is probable that an opportune course of quinine, would assist the system in warding off Cholera Asphyxia.

There is reason to believe, that those residing in well-built houses, and sleeping one or two storeys above the ground-floor, are less liable to the disease than those who sleep on the ground, or on mud floors little raised from the surface. As a preventive, therefore, let as much attention as possible be paid to the comfortable condition of the dwellings of those exposed to Cholera.

VI. OF THE MEANS BEST CALCULATED TO ENSURE RECOVERY.

Cholera Asphyxia is a disease which leaves no time for hesitation or delay in its treatment; but, unfortunately, its prominent symptoms are far from indicating the means best adapted for its cure. In

such circumstances, a correct notion of the nature of the disease, or experience, is the only foundation on which we can hope to establish a successful mode of treatment. The opinion which has been offered, in the previous pages, in explanation of the nature of Cholera, has this to recommend it, that it explains, to a certain extent, the line of practice which has been found most successful in overcoming the disease.

The following may be considered the indications of cure :—1. To relieve the oppressed circulation ; 2. To stimulate the system ; 3. To restore the heat of the body ; 4. To guard against local congestion ; 5. To keep down reaction ; and, 6. To produce a healthy condition of the alimentary secretions.

1. Writers and practitioners have found it so difficult to account for the almost magical effects of venesection in Cholera, that they have puzzled themselves for explanations of the *modus medendi* of this remedy. One class are anxious to discover a stage of high action, which, as they assume, will be the proper time for bleeding. Others anxiously look for proofs of local inflammation, as an apology for removing blood from a patient in the last stage of general collapse. And a third set bleed, because, as they say, there is determination of blood to the abdominal viscera. It will be admitted, that not one of these reasons is satisfactory. Cholera, as I have endeavoured to show, is not collapse consequent on high action. Inflammation is not conceived to be possible after the heart has ceased to

circulate arterial blood, and when its action, if it have not ceased, is sunk into a mere flutter. And it is hoped that it has been made evident, that what are called symptoms of determination to internal parts, are explained by the fact, that venous congestion becomes greater, where the circulation is freest, and where there are no valves to prevent the veins from being gorged by regurgitation. If indeed the discharge of serous fluid by capillary vessels is to be regarded as a proof of determination of blood to internal parts, the blood must also be determined to the surface, from which a similar fluid is simultaneously discharged. But it will hardly be received as a legitimate reason for removing blood from the surface, that it had been already withdrawn from it.

The effect of blood-letting in Cholera is obviously in a great degree mechanical. The power of circulation has been injured; it is no longer capable of duly distributing the mass of blood in the system; and the cessation of the usual secretions, the deficient pulmonary function, and the effect of the discharges, have rendered the blood wholly unfit for vital purposes. By bleeding in such circumstances we relieve the gorged vessels, and thus enable the weakened energies of the circulating power, to act on the disburdened organs of circulation, and to restore the current of the blood. The lungs recover their function, pure blood is thrown into the left heart, the arteries are again filled with fluid fit to support life: this, it may be supposed,

reacts on the sympathetic system, and by and by its energies are completely restored. In this way only, can the effect of blood-letting in Cholera be explained. No other method will account for the almost instantaneous recovery which so often follows venesection in such a condition of the system as has been described—a recovery more immediate than that which follows the removal of mechanical pressure from the brain. And it is confidently asserted, that in no case in which it has been possible to persevere in blood-letting, until the blood flows freely from the veins, and its colour is recovered, and the oppressed chest is relieved, will the patient die from that attack of the disease.

The value of this remedy is well stated by Mr Scott in his report already alluded to,* in which he says, "Few remedies, on a fair trial, have been more "generally and unequivocally advocated than free "blood-letting; and the most that has been urged "against it is, that it is not always successful. The "advocates for bleeding proceed, however, on the "principle, that a certain quantity of blood is to be "obtained in order to insure success, which few of "them estimate at less than about thirty ounces. "Those who are disposed, either less favourably "towards bleeding, or to condemn it altogether, "object, that if the circulation is in a condition to "admit of free bleeding, the case is a mild or fa-"vourable one, and would probably yield to other

* Madras Report, p. lviii.

" remedies. There is no doubt that fatal collapse has " sometimes followed even *large* bleedings, which " has staggered the faith of many practitioners in " the general safety of the remedy; but, in the great " majority of cases, it is after *small* bleedings that " this has happened. There is the most ample evi- " dence also, that cases, especially in Europeans, " even under the most favourable appearances, will " often, in spite of all internal and external reme- " dies, go on to a fatal issue when bleeding is not " practised."

Mr Scott proceeds to exemplify these facts, by extracts from the reports of surgeons who have had most experience of the treatment of the disease; which are not only illustrative of the importance of the remedy, but prove the difficulty to which the usual doctrines on the subject of bleeding expose the practitioner, in his endeavours to explain the rationale of blood-letting in Cholera.

As Mr Scott has truly said, cases often occur in which all remedial means are completely thrown away. The remote cause of the disease is apparently in such a state of concentration, or the idiosyncrasy of the patient is such, that he is at once struck with death. In the very outset of the disease, like an animal which has had a full dose of the upas antiar, the circulation is found to have ceased; the heart no longer beats; and though the sensorial and respiratory powers remain, every effort to restore the pulse and bring back animal heat fails; the body becomes every minute more and more dead,

the breathing is slower, and the looker-on has a painful consciousness that respiration is becoming more and more useless: Insensibility creeps on, and the transition to death can scarcely be marked. In such a case, every remedy is unavailing. If any blood can be removed, it is grumous and black, and the veins in the immediate neighbourhood of the operation only are emptied. Stimulants produce no effect, and the application of even moderate warmth is not endurable, or perhaps the skin is quite insensible. Vesicatories do not act, and leeches can draw no blood. In these circumstances it is evident, that the patient's fate is sealed. In watching such a case, however, there will sometimes be discovered an effort, as it were, on the part of the heart, to rally; it will be perceived to act, and the pulse will even begin to flutter; and it has happened, that, just before death, there was an evolution of animal heat, so that the corpse became warmer than the patient himself had been, an hour before death. It is therefore the duty of the surgeon to watch such a case most anxiously; the lancet may yet avail, and, as has happened, " the " blood was found unexpectedly to flow, the stream " improved, and the *dead man* got up and walked " away." *

In commencing the treatment of Cholera, then, no time is to be lost in endeavouring to bleed the patient. He should be laid in a warm bed; and the

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* The words of a friend in describing a remarkable recovery.

great object being to get blood to flow, it is important that the operation should be performed with as little fatigue to him as possible. He should be kept in the recumbent position; and, as answering the two next indications will be the means of forwarding this important object, immediate recourse should be had to stimulants—applying artificial heat, using friction, &c. The rule as to the extent to which the removal of blood should be carried, is very simple; it has no reference to the prostration of strength, or to the constitutional stamina of the patient. The power of circulation is unable to give motion to the volume of blood which has accumulated in the venous system, and which has been rendered, by the cessation of secretion, the diminished function of the lungs, and the disordered actions, incapable of supporting life; and blood is let, until it appears that so fatal a condition of the vital fluid has been changed. In other words, the blood ought to be allowed to flow, until the natural current in the veins has been restored, and there is evidence, in the improved colour of the blood, that the lungs have recovered their function. If opening one vein be not sufficient, let others be tried; and, until the disease yields, the practitioner must persevere in his endeavours to accomplish this great object. In the outset, perhaps only a few drops of tar-like blood can be obtained; by the use of internal and external stimulants, some good appears to be done, and the pulse rises;—renewed attempts should im-

mediately be made to remove blood; nor should these be desisted from, while life remains. In addition to the lancet, leeches or cupping glasses should be tried. It is to be remembered, that, added to the general venous congestion, there may be a tendency to morbid plethora in particular organs. There is sometimes confusion of head, and more obtuseness of the intellectual faculties than usual. This is not only a bad symptom with reference to the present condition of the patient, but may become a source of serious injury, after the primary disease is relieved: in such cases, as many leeches as will adhere, should be applied to the temples and throat. The abdomen is in every case the principal seat of congestion; leeches ought therefore to be applied to the belly also, and particularly over the seat of the liver, care being taken to avoid, as much as possible, exposing the patient's body to cold. It is unfortunate, however, that, like blisters, leeches, during extreme collapse, are quite useless.

2. To stimulate the system. Though classed as the *second* indication of the treatment of Cholera, yet, in their application, blood-letting and attempts to stimulate the system, ought to go hand in hand. The object is to restore the suspended circulation. Blood is let, in order to diminish the quantity of blood to be acted upon, and stimuli are administered, in order to excite the source of power. Indeed, it is often impossible to render bleeding efficient, until after these have produced some effect.

It is not merely by internal remedies that this indication is to be answered: Frictions over the whole surface, rubifacients and sinapisms to different parts of the body, are in truth important portions of the stimulating remedies.

Every practitioner of any experience, has his favourite prescriptions. The internal remedies which have been resorted to, with most confidence and success, in the treatment of Cholera Asphyxia, are, opium, æther, camphor, ammonia, peppermint, drogue-amer, spirits, and calomel.

The general mistake in the treatment of Cholera has been, the administering of too large doses of those medicines which have obtained a high character among practitioners. The large doses of calomel and opium, which many are in the habit of prescribing, are especially pernicious. This practice seems to arise from the nature of the disease being misunderstood. A patient is suffering from violent vomiting and purging, and excruciating spasms, and the indication appears to be to allay these high actions. Hence opium and calomel are prescribed in quantities, amounting to what are considered sedative doses. There can be little doubt that more injury than benefit has resulted from this practice; for, should the disease be overcome, and the medicines not have been evacuated, 10 or 20 grains of opium, and 60 or 100 grains of calomel, must act as poison on the restored functions. The bad effects of the mistaken notions, as to any quantity of opium being not only

safe, but useful, in the treatment of Cholera, have not been confined to those licensed to make such experiments on their fellow-creatures, but have been resorted to by gentlemen, who, having no medical man near, were obliged to prescribe for sick servants and others. It is well known that patients have died from the after effects of over-doses of the narcotics so administered. One gentleman, in particular, of my acquaintance, was rendered seriously unhappy, because a servant, suspected to be labouring under Cholera, to whom in a few hours he had given 500 drops of laudanum, died evidently from the effects of the medicine.

The object being then to stimulate the system, medicines should be prescribed in such quantities as are known to act as stimuli. In fever, a scruple of calomel, no doubt, will very often allay at once the irritability of the stomach; and experiments seem to prove, that in large doses this medicine acts sedatively on the gastro-enteric mucous membrane. It has been ascertained by experience, that most narcotics, in large doses, act as sedatives very soon after being administered, while it is unquestionable that the same medicines, in small quantities, excite the circulation, and are consequently to be regarded as stimulants. Early in my practice in Cholera I found reason to believe, that while there was positive good to be done by small quantities of these medicines, frequently repeated, their good effects were very questionable in the powerful doses which were commonly prescribed.

The condition of the stomach in Cholera generally renders the exhibition of medicines in a liquid shape, in the outset of the treatment, wholly useless, as they are immediately rejected by the stomach or bowels. It is therefore advisable, at least while the vomiting is violent, to administer the remedies in the form of pills. A prescription will be found in the foot-note, which was not only given with great benefit to patients (adults), immediately on my being called to them, but which was distributed in large quantities, for the use of the sick, wherever Cholera was reported to exist in the districts over which my professional charge extended.*

The pills should be washed down with a small quantity of brandy and water, and as soon as the stomach seems quieted, such a draught as is prescribed in the foot-note should be exhibited.†

It was at one time the general opinion, that it is dangerous to allow a patient, under the influence of

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* R. Calomel. gr. iii.; L. camphor, gr. ii.; opii, gr. ss. Mis. ft. Pil. One of these was given every half-hour, and sometimes oftener, while the urgent symptoms continued. The native assistants, in the districts, had orders not to persevere in this practice longer than three hours, if they had reason to believe that all the pills were retained.

† R. Æther sulph.	- -	gt. xxx.
Tinct. opii,	- - -	gt. x.
Misturæ camphor,	- -	℥ i.
Mis. ft. Haust.		

Draught to be taken immediately, and repeated every quarter or half-hour, according to the urgency of the case.

Cholera, to have cold drinks. The prejudice against these, (which is still very general), arose from the circumstance of vomiting and purging being very often aggravated, apparently, by the patient's attempting to allay his urgent thirst by drinking cold water. The distressing craving of the patient for cold drinks, and his almost hydrophobic horror of the hot fluids which were invariably offered him, induced me early in my practice to doubt the propriety of rigorously prohibiting the gratification of a desire which was in every case so strong.

Mr Annesley found by experiment, that tartaric acid dissolves the viscid matter which is so often found, after death, lining the enteric mucous membrane; and he latterly allowed his patients lemonade, a beverage which they found delightfully refreshing. He also prescribed a drink containing nitric acid, in the hope that while it was agreeable to the patient, it might communicate oxygen to the system. Whether we admit the importance of dissolving, while the disease exists, the fibrinous matter on which tartaric acid is here said to act, or imagine that oxygen can reach the system in the way Mr Annesley seems to expect, when it is no longer absorbed in the lungs, the practice of Mr Annesley is certainly a real comfort to the patient, and can be attended with no bad effects.

In the very outset of the treatment, friction over the whole body, and shampooing of the extremities, should be resorted to. Friction is best applied by means of hot flannel. It may be necessary, how-

ever, to use hot spirits of turpentine; and rubbing with the flannel should be continued until the turpentine is rubbed dry. Bags of hot sand or salt should be applied to the extremities or other parts of the body; but this will often, while the extremity of collapse continues, prove insupportable to the patient.

Blisters during extreme collapse are quite inert, and the emplastrum lyttæ is too slow in its operation to prove serviceable. Mustard cataplasms are a more valuable remedy: these may be applied with advantage all over the abdomen, and to the calves of the legs, soles of the feet, and even to the chest. Nitric acid has been resorted to, in order to produce an immediate blister—it does not seem to have been attended with any marked benefit, and it is apt to produce an escar which may prove afterwards extremely troublesome. Boiling water is also recommended with the same view, and has apparently, in some practitioners' hands, been found useful. Partial topical applications, however, are not much to be depended on, and, as has been already observed, vesication cannot be produced during Cholera. The disease is a failure of an important *power* of the system, and the object in stimulating the skin is to assist the internal remedies in exciting this suspended power. But as yet there is no local affection to be removed by topical applications, although these may become very valuable in the after indications of cure. In the present stage of the treatment, therefore, an

extensive application of sinapisms, or the general embrocation of spirits of turpentine alone, or combined with tincture of cantharides, or of oil and hartshorn, or any other powerful rubifacient, is to be regarded as the best means of assisting the internal stimulants in their operation.

3. To restore the heat of the body. The heat of the body can only be effectually brought back by re-establishing the circulation of the blood. At the same time, remedies, having in view the restoration of the deficient animal heat, have been considered by most practitioners an important part of the treatment; and therefore they are not unworthy of a separate consideration. No one of these three indications, however, although classed *seriatim*, should precede or wait upon the others. The treatment should be commenced with any one of the three which can be most easily answered, and the whole of them ought to be considered as belonging to the first branch of the treatment of the disease.

There is one very remarkable circumstance attending the worst description of Cholera, which has been already repeatedly alluded to, viz. the morbid sensibility of the patient's skin, and apparently of his stomach, to the presence of any thing raised above the temperature of the air. A warm bath, for instance, of a heat even some degrees below 100 of Fahrenheit, has been found so insupportable, that a patient, after being immersed in it for a few minutes, has sprung out of it, almost with spasmo-

dic energy, and entreated that he might not again be exposed to so painful a remedy. A similar feeling is very commonly produced in the patient, by swallowing liquids not more than lukewarm.

Notwithstanding, however, the instinctive dislike to artificial heat, exhibited by so many patients labouring under the disease, still it is advisable that attempts should be made to restore the heat of the body. The patient, therefore, immediately on his being attacked, ought to be placed in warm blankets, and every endeavour used to keep his extremities warm, preventing as much as possible his throwing off the bed-clothes, or removing himself from the heated articles which are applied to him.

The importance of restoring, if possible, the deficient animal heat, has led to various contrivances for applying warmth. The hot water bath was at one time much used; but the delay which generally attends the preparation of a bath, the fatigue of using it, and the exposure and fatigue in drying the patient, already alarmingly debilitated, has led to the general opinion, that the hot water bath is more injurious than beneficial. It has been found, that the principle which should regulate the application of heat to Cholera patients, is, that it should be done with the least possible fatigue to them. With this view, various descriptions of vapour baths have been proposed. The simplest and most expeditious is that which has obtained the name of Dalton's bath, which is exceedingly manageable. It is formed by putting vessels, contain-

ing burning spirits, under the cot or couch on which the patient is laid, while the cot is surrounded with blankets, by which means any degree of heat which may be required is obtained. Pots of ignited charcoal will answer the same purpose.

The objection to that method of applying heat is, that if bedding be used, the heat is long in penetrating it; and if the patient be laid on the rattans or on a mat, the heat is partial, and soon becomes insufferable to him. But there is one method of using heated spirit vapour, which is well calculated for applying heat immediately, and generally, to the body. An arched frame is made, rising a foot or eighteen inches, five feet long and two broad; the arched part of this frame is filled up with basket work, and one end is closed up with a half circle of wood; the lower part and upper end are open. This is placed over the naked body of the patient, and covered with blankets, the patient's head being left free; the small and upper end of a curved tin chimney is introduced through a hole, in the boarded part, the other end being placed over a spirit-lamp. Heat to any extent may be thus introduced within the basket work, and brought into contact with every part of the patient's body. Another advantage of this method is, that assistants may introduce their hands within the basket work, and use frictions and embrocations, or apply leeches, without exposing the body of the patient to cold.

When there are not such conveniencies as these

at hand, recourse must be had to hot blankets, bottles of hot water, bags of heated sand, &c. But unfortunately it often happens, that the best contrived methods are so painful to the patient, that they cannot be persisted in.

The general result of the steps which must be taken to overcome the disease, is, that venesection is to be immediately resorted to, and every endeavour made to get blood to flow, until the congestion is relieved, and until there is evidence that the function of the lungs and action of the heart are so far restored: For the same purpose stimulants are prescribed; and artificial heat is applied to assist the returning circulation, in raising the temperature of the body to the natural standard.

In all this nothing has been said of astringents, antispasmodics, &c. All who restrict their attention in the treatment of Cholera to the discharges and spasms, are in danger of losing sight of the true nature of the disease. They are prescribing for *symptoms*, which, it will generally be found, at once disappear, when the power of circulation is recovered. In fact, the removal of blood, to the necessary extent, has invariably, so far as the Author's experience goes, put an immediate stop not only to spasms and oppression, but to vomiting and purging, and has relieved the prostration of strength. And in no situation has the physician more reason to be proud of his art, than when, in the course of a few minutes, a patient, from the agonies of Cholera, and from the jaws of death,

is placed in safety, and not only restored to a sensation of health, but to one of positive bliss.* The effect of blood-letting would indeed sometimes appear almost miraculous. A patient will be brought in on a cot, unable to move a limb, and, but that he can speak and breathe, having the character (both to touch and sight) of a corpse, yet will he, by free venesection alone, be rendered, in the course of half an hour, able to walk home with his friends.

The following case will illustrate this :—

When marching up the country with a detachment of troops in July 1819, a camp-follower was brought into my tent (9 o'clock P. M.) in a blanket. He was reported to have been suffering from symptoms of Cholera during the whole afternoon. His skin was cool, pulse weak and thready ; had spasms in the extremities ; urgent thirst. I immediately bled him, and with some difficulty obtained a full stream. When about twenty ounces of blood had been removed, the man felt complete relief. Some brandy and water was administered, and he returned with his friends to his own quarters. He was able to accompany the detachment next morning.†

There cannot be a more decided proof that this disease *becomes* one of pure congestion, and that the immediate cause of the remora in the circula-

* A very common expression on such an occasion is, " Oh, " sir, I am in heaven !"

† Author's Case-book.

tion, whatever that may have been, no longer exists, than the almost instantaneous effects of removing a portion of the redundant, and, to say the least of it, *inert* venous blood. All know, that however successful bleeding may be, in relieving the more urgent symptoms of inflammation, complete restoration is not the immediate result; that inflammation is not a mere fulness of the vessels of the affected part, but that the arteries are in a morbid condition; and that time is required to restore them to their healthy action, not uncommonly the most difficult part of the treatment. And we are therefore fully warranted in concluding, that if Cholera consisted of a diseased condition of any portion of the arterial system, recovery could not be so instantaneous.

Breathing oxygen, or an air containing more of this gas than is contained in the atmosphere, has suggested itself to most practitioners; and it certainly is well worthy of trial, though it is to be feared, that, so long as the lungs are unable to appropriate the usual quantity of oxygen from the atmosphere, little benefit can be hoped for from altering the proportion of that gas. I should also, if possible, resort to galvanism, throwing the galvanic stream through the abdomen.

But having arrived at the conclusion that the great object is to stimulate the sympathetic system of nerves, it is to be hoped that experience may enable us to attain this object more effectually than we have hitherto done.

Before proceeding to what (if the conclusions arrived at above, as to the nature of Cholera, be correct) may be considered the after treatment of the disease, it is proper to say a few words on the Prognosis; premising that, as yet, the disease will not have exceeded a very few hours of illness.

Prognosis. The most satisfactory symptoms, in the early stages of the treatment of Cholera, are, the return of the natural colour of the lips and nails, a rising of arterial action in the extremities, and recovered animal heat. The proof that the disease is overcome, is in the restoration of the function of secretion, which is most satisfactorily evinced by the patient's making urine. Such decided symptoms of success may not immediately make their appearance, particularly if blood have been removed with timidity; but let it be remembered, that eight or ten ounces may in one case be sufficient, while in others depletion must be carried to the extent of forty or fifty ounces of blood, before there shall be reason to believe that the overburdened vascular system is relieved.

It frequently happens, that when there is not sufficient confidence in blood-letting, the case is painfully protracted; that for several hours the patient's life will seem hanging as if by a thread; the pulse at the wrist will repeatedly fail and return; oppression, deafness, vomiting, purging, and spasms will continue; the body will remain cold, and there will be every reason to dread a fatal termination;—of which the following case is an example:—

Dharwar, April 1820.

———, Assistant-Surgeon, Honourable East India Company's Service:—marching up the country in medical charge of a detachment of troops, which, previous to their arrival at this station, had suffered severely from Cholera at different stages in their progress. He had never seen the disease before; and the bad success of every method of treatment which he had pursued, had impressed him with absolute horror. He was taken ill himself at two o'clock in the afternoon, having marched with the troops eleven miles in the morning. He took some antispasmodic medicines, and when I first saw him, about five o'clock P. M., collapse had made very small progress. Having unfortunately lost every case in which he had attempted to bleed, and being unable to reconcile his mind to the safety of losing blood in the alarming state of debility in which he found himself, he would not consent to be bled. While using every endeavour to overcome his repugnance to this important remedy, stimulants were administered, and the other means pursued which were considered likely to save the patient. The disease pursued its course, the spasms became excruciating, and the sensation of burning heat at the præcordia insufferable. There was almost incessant vomiting, and the purging was very troublesome. About midnight the young man became hopeless; he was then very nearly in the last stage of the disease; and as persevering attempts continued to

be made to obtain his consent to blood-letting, he at last said, nothing could make him worse, and that he would make no farther objection to any method of treatment that might be thought advisable. A vein was immediately opened, and with considerable difficulty blood was made to flow; the stream however improved, and, when about fourteen ounces had been removed, the blood was flowing in a full stream though still black;—the patient however became alarmed, he withdrew his arm, and positively refused to allow another drop of blood to be taken from him. But his pulse had become more distinct, and as there was some cessation of the more violent symptoms, it was hoped that with the assistance of stimulants and warmth, he might yet do well. The relief, however, was not permanent; the spasms, vomiting and purging, became again severe, and continued more or less so throughout the night, and up to the forenoon of the following day; when the patient was in an alarmingly low state, his body was cold, and his pulse was scarcely perceptible. About two o'clock P.M., twenty-four hours after the accession of the disease, he seemed completely exhausted, all the violent symptoms had for some time ceased, and he fell into a doze, which had the appearance of the torpor which sometimes, in this disease, immediately precedes death. By five o'clock, however, a decided change for the better had taken place, and symptoms of restored actions became apparent. Towards night he was out of danger,

but it was some time before his health was re-established.

This case illustrates the nature of Cholera :—In its very commencement the patient was alarmed and immediately prescribed for himself, and had he consented to venesection at the early stage at which he was seen, the case would have proved a very manageable one. When the patient at last allowed himself to be bled, after ten hours' illness, it was within a very little of being too late, as the blood was found very nearly stagnant, and it was only by kneading the arm that the first few ounces were procured. The opinion I formed at the time, and experience has confirmed it, was, that had the vein not been closed until the colour of the blood had been restored, little else would have been necessary to render the patient fit to return to his duty in a day or two. There cannot be a doubt, however, that the bleeding, such as it was, saved the patient's life, although unquestionably he owed much to a strong constitution.

In contrast to this young surgeon's case, a portion of a letter is subjoined from an experienced medical friend, in reply to some observations of mine, addressed to him after he had recovered from a second attack of Cholera :—" I agree perfectly with you regarding bleeding (in Cholera), " and I have no hesitation in saying, that, if it " were possible to take every case of Cholera in " sufficient time, so as to produce syncope by

"bleeding,* the disease would not appear so for-
"midable; but the sad misfortune is, that no one
"on the first symptoms, (which are so alike to
"fear), will admit that the disease is affecting him.
"In the last attack, of the first few cases, eight I
"think, every one died; which so completely
"puzzled me, that I was at a loss what to attempt.
"I had tried bleeding, and every remedy I had
"heard of, even to milk of magnesia, and the va-
"pour bath—and to no one could I give the slight-
"est preference: my patients sunk so rapidly after
"coming into hospital, that I was almost induced
"to think the disease had assumed a new charac-
"ter. I suspected that I had been deceived as to
"the period of the invasion of the disease in those
"cases; and the most positive regimental orders
"were issued regarding an early application for
"aid, by individuals who might have the least rea-
"son to suspect themselves attacked. I was soon
"enabled to resume my old and favourite remedy,
"the lancet, and with such success, that the Mus-
"sulmans even admitted the successful practice
"of bleeding. I myself was seized about three
"o'clock in the morning, after having undergone
"for some days a great deal of fatigue and watch-
"ing—and the very moment I passed a watery

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* It is extremely difficult to produce syncope by bleeding in Cholera—the principle which I have laid down in the text, to draw blood until its character improves, and the energy of the circulation is restored, is both a better and a safer rule.

"evacuation and vomited, I bled myself to twenty-"four or twenty-six ounces, which brought on syn-"cope; blistered the pit of the stomach with can-"tharides and turpentine, and took the pill, which "I always give, of ten grains of calomel, three of "opium, and three of camphor. I used no stimu-"lants of brandy or wine internally, but repeated "the calomel, ten grains every three or four hours "during the day; and took castor oil at night, "which brought away stools tinged with black "bile. Drs Hastie and Edwards came over about "five o'clock in the morning, and continued with "me the greater part of the day. The turpentine "and cantharides acted most violently—it was "rubbed in as is done in blistering horses, which "produced an immediate effect, but was dreadfully "painful afterwards."*

These sketches of the cases of two medical men, not only illustrate the effect of treatment, but will, so far as they go, account for the various opinions which are entertained, as to the proper practice in Cholera. In the first, an intelligent young man is left entirely to his own resources, in medical charge of troops: while on a march they are attacked with Cholera, and he thus sees the disease for the first time, at a period when it is impossible to pursue investigations as to its nature, and when his practice

* Letter from J. Cox, Esq. Assistant-surgeon, Hon. East India Company's Service, to the Author, dated Camp at Kaladgee, 29th July 1821.

must be guided by what he has heard or read. As almost constantly happens on the first breaking out of the disease, most of his cases prove fatal: bleeding having proved unavailing, he has become impressed with the belief, that this operation should not be resorted to in Cholera; and when attacked himself with the disease, by his obstinate resistance to venesection, he brings his life into the greatest jeopardy, and suffers a protracted illness. The second is the instance of a surgeon, who, having had much experience of Cholera, had learned justly to appreciate the value of blood-letting. But even he is staggered in his confidence in his "old and favourite remedy," by its uselessness in the first cases. Having fortunately, however, discovered, that the cause of this is not in the inefficiency of the practice, but in the delay of the application for relief, proper steps are taken to prevent this fatal loss of time, and he is enabled to re-establish the character of venesection; and, when attacked by the disease, by immediately resorting to this remedy, renders himself fit for duty in 24 hours.

But to return to the Prognosis. The restored circulation, return of animal heat, and re-establishment of secretion, are to be regarded as proofs that the patient is safe. When, on the contrary, collapse continues, and arterial action is nowhere perceptible; when the temperature of the body becomes more and more death-like; and, above all, when a profuse cold and clammy perspiration breaks out over the whole surface, accompanied with jac-

titation, there is little reason to hope for a favourable change.

It has been found that the more violent the prominent symptoms are, the more likely is a cure to be effected; and that when the disease is attended with rapid collapse, little or no vomiting and purging, and no spasm, the prognosis is very unfavourable. But it may be again observed, that, even in the most hopeless case, it is the duty of the surgeon to continue to watch his patient to the last, as instances have occurred in which recovery has taken place, when, to every appearance, the patient was in articulo mortis.

4. To guard against local congestion. Most men, either from original organization or accident, have some weaker point in their constitution, which is liable to manifest itself when the system receives any serious shock. In a London hospital, death following a great operation, frequently does not appear to result from the local injury; the wound may seem to be going on most favourably, when the patient is seized with low inflammation of the chest, and "he dies of disease of the lungs." So also in tropical climates, a serious injury may not destroy a person by its immediate effects: the fractured limb, or broken head, appears in a fair way to do well; but the patient is attacked with hepatitis, or dysentery, and carried off. These facts illustrate the necessity, in cases of great constitutional derangement, of extending our attention beyond the mere original disease. In Cholera,

this is particularly necessary. When the primary disease is relieved, it is the duty of the practitioner to look most carefully to the condition of the head, of the lungs, of the liver, and of the bowels. The great risk appears to be, that a local congestion shall follow the general one. This, from the nature of the circulation in the liver and lungs, is perhaps more likely to happen in these organs than in the head. Should congestion then take place in any of those great organs, active measures must be immediately resorted to. Leeches, blisters, and mercurial purgatives, will be requisite; and instances occur in which, from the condition of the hepatic system, it is necessary to administer mercury until it produce salivation.

The affections of the head, after an attack of Cholera, are generally rather of the nature of reaction, than of congestion. A mixed and obscure case is occasionally met with, in which there are both conditions of the vessels of the brain;—an instance of this is given at page 77. But, unquestionably, pure congestion sometimes takes place within the head, which is to be overcome by free topical depletion and active purgatives.

When the lungs, and consequently the heart, have their functions deranged after an attack of Cholera, it is generally difficult to discover what is going on: The patient does not recover as usual; he is troubled with depression and debility; his skin is ill-coloured, and perhaps his pulse is irregular. In such circumstances, leeches should be

applied to the chest, and a blister over the seat of the heart, and alteratives should be prescribed. As it may be advisable to reach the source of respiration, a blister should be applied to the nape of the neck.

The tendency to local congestion may not be immediately disclosed; particularly when it takes place in the liver. This arises from the obscure nature of the symptoms of derangement in the substance of the liver. It is consequently always advisable to pay the utmost attention to the hepatic system, after recovery from Cholera: many owe permanent loss of health, and much future suffering, to neglect of this great venous organ, while convalescent from Cholera Asphyxia.

5. To guard against reaction. It is remarkable that reaction should so seldom take place after attacks of Cholera. When symptoms of this condition do occur, they are generally partial, and are rather to be attributed to irregularity in the balance of the circulation, than to pure reaction; so that even in one and the same organ, there will be deranged arterial action and venous congestion.

A patient on being relieved from the symptoms of Cholera, usually falls into a sound and refreshing sleep, and on awaking, has the feeling of being quite well. There may be still, however, tinnitus aurium, and a slight feeling of confusion of head, and giddiness. These symptoms, no doubt, very often arise from the effects of the powerful narcotic remedies which have been used, and will most

likely be removed by freely acting on the bowels. But if there be superadded pain, intolerance of light, a contracted pupil, and a hard pulse, immediate attention must be paid to the head. Local depletion in these cases is perhaps better than general blood-letting. Sixteen or twenty ounces of blood should be drawn from the temples by leeches or cupping glasses—active mercurial purgatives should be exhibited. And if by these means the symptoms be not immediately relieved, the head must be shaved, cold applied, with blisters to the occiput and nape of the neck; and should the pulse continue hard, general depletion may be advisable, though topical bleeding, when it is possible to carry it to the necessary extent, is as effectual, and safer in cases in which removal of blood has already taken place to a considerable extent. It is unnecessary to enlarge farther on the treatment of such a case, as it can no longer be considered to belong to the subject of this treatise.

6. To produce a healthy condition of the bowels. This is an indication which must in every case be attended to; for, however short the cessation of secretion may have been, and however easily the symptoms of Cholera may have been removed, the restored functions seem to pour into the intestinal canal colluvies, which must not be allowed for a moment to lurk in it.

Calomel is a medicine of the greatest value, when the urgent symptoms have been removed; particularly if, as sometimes happens, watery alvine

discharges continue. As soon as the circulation is restored, ten grains or a scruple of calomel should be exhibited, and followed up, after the patient has had a few hours of rest, with a large dose of castor oil; a draught of the infusion of senna, tincture of jalap, and tartrate of potass; or by a dose of compound powder of jalap. It is, however, dangerous to risk bringing back the irritability of the stomach; and when there is any fear of this, it is better to give the cathartics in the form of pills.*

Glysters, large and purgative, are also very valuable in cases in which the stomach is still irritable; and they may also be used in order to assist the purgatives taken by the mouth, when slow in their operation.

The object at this period of the treatment is, to procure *feculent* discharges, and to have evidence that bile is not only flowing freely into the intestines, but that its secretion is restored to its healthy condition; and the practitioner must be satisfied that the kidneys have recovered their function. As soon as there is reason to believe that these important secretions are restored, the patient may be pronounced perfectly safe, although it is always advisable to strengthen him by tonics, diet and regimen; and, as a relapse is to be much dreaded, the patient must not be allowed to be led, by his own

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* The following formula has been found a valuable one after Cholera:—R. Extract. colocynth. gr. x. calomel, ext. hyoscyam. a. a. gr. v. Divide in pilulas iv.—et sint pro dosi.

feelings of recovery, to undue exertions of strength, or unnecessary exposure to fatigue, cold, or any of the exciting causes of a disease, a return of which is rendered only more probable, by a previous attack.

It sometimes happens, that without being able to trace the symptoms to local congestion or reaction, it is extremely difficult to restore the functions of the stomach and bowels to a healthy condition; and the patient continues to suffer cramps in the extremities, even for many days after the urgent symptoms of Cholera have been removed. In all cases of this kind it will be found, that it is not only the alimentary secretions that are at fault, but that the kidneys have not recovered their healthy function; and the thirst of the patient will shew, that the salivary and gastric secretions are still deficient. These cases may be explained by the supposition, that the sympathetic system has been more permanently injured than is usual. The treatment in such circumstances should consist in persevering in active purgatives, prescribing a course of alteratives, and freely exhibiting quinine; and it may even be advisable to produce slight ptyalism.

APPENDIX.

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*The following Case from the Russian Reports on Cholera, exhibits the identity throughout, of the Russian and Indian types of the Disease.**

" The disease began at two in the morning, with " a dreadful purging, which returned every minute. " Although the weather was cold and wet, the pa- " tient went out of doors to obey the calls of nature, " barefooted and undressed, and without any pre- " caution. About five o'clock he was without feel- " ing, quite powerless, and affected with constant " cramps. At six I found him again sensible, but " with sunken pale-blue cheeks, dimness of the " eyes, coldness of the feet and hands, and bedew- " ed with clammy sweat. He was tossing about, " and complaining of trembling of the hands, a " sense of oppression at the pit of the stomach, " and intolerable thirst. The vomiting, which, ac- " cording to his own account, commenced much " later than the purging, was at this time less fre-

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* Edin. Med. and Surg. Journal, No. cviii. p. 121.

" quent than it had been ; but the alvine discharges " continued to recur incessantly, and were passed " involuntarily. The exhausted powerless condi- " tion of the patient, in particular, his completely " imperceptible pulse, both at the wrist and over " the heart, the stiffness of the limbs, the cold- " ness of the tongue, belly, and præcordia, left " me no hope of his recovery. The administration " of opium with oil of peppermint and ether check- " ed the vomiting only for a short time ; anodyne " clysters had no better effect on the diarrhœa ; " and warm frictions, spirituous drinks, and even " the hot bath, were resorted to without success to " restore the temperature and bring back the pulse. " An unsuccessful attempt was in the last place " made to draw blood from a vein ; and soon after- " wards the man expired. Twenty minutes after " his last breath, and when the corpse had been " already washed and dressed, it was affected all at " once with frightful movements. Convulsive mo- " tions took place in the hands and feet, like those " excited by galvanism, commencing first in a few " muscular fibres, especially in the neck and thighs, " extending in a vermicular manner, and suddenly " producing bending of the head, and agitation " and elevation of the feet. These spasms con- " tinued with intervals for ten minutes, becoming " in the end faint and rare. The same phenomena, " though in a less remarkable degree, were observ- " ed on another occasion only, but so long as six or

" seven hours after the termination of the symptoms
" of the disease."*—Russian Reports, p. 115.

INDIAN CASES.

Case in which the Disease appeared to be overcome by the use of Stimulants.

Fort Dharwar, 19th January 1820. Cool season. Range of thermometer from 50° to 75° in shade.

Papdoo.—Sepoy, C company 2d battalion 4th regiment Native Infantry. Admitted into hospital from the lines, (from whence he had walked, nearly a mile, with assistance), at half past eight o'clock A. M. Has had frequent vomiting and purging since gun-fire this morning. His eyes and countenance sunk; pulse very small and quick; skin cold; much thirst; no spasms.

Habt. stat. submur. hydrag. gr. x. opii gr. ij. in pil. et spt. vini, ℥ ij. aq. fervent. ℥ ij. in haust.

9 A. M.—His pulse had left him; but he now seems revived by the medicine. His pulse has risen and his skin is improved. Cont. brandy and water.

10. A. M.—He has vomited since last report, and his pulse is weaker.

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* " These muscular contractions after death were also occa-
" sionally observed in the Cholera of the East Indies."—*Reviewer.*

R. Tinct. opii, spt. æther sulph. a. a. ʒ ss. aquæ fervent. ℥ i. Mis. ft. haust. stat. sumend. et rept. omni semihora.—Cont. brandy and water.

11 A. M.—His countenance is completely sunk; pulse not perceptible; no spasms; urgent thirst.—Cont. ut supra.

Noon.—After taking a little cold brandy and water, he fell into a dose. Skin improved.—Cont. ut supra.

2 o'clock P. M.—In the same state.—Cont.

4 o'clock P. M.—No better.—Cont. ut supra.

6 o'clock P. M.—Voice stronger; pulse is again perceptible; skin warmer.—Cont. brandy and water.

9 P. M.—Pulse easily felt; skin improving.

Habt. submur. hydrag. gr. x. stat.

20th.—Vomited twice during the night, and had three watery yellow-coloured stools, but slept well; no pain or uneasiness; pulse rather frequent; skin natural; tongue foul; thirst.

Habt. pulv. jalap comp. ʒ i. stat.

Vesp.—Stools still watery.—Rept. submur. hydrag. gr. x.

21st.—Has had one yellowish feculent stool; pulse small and quick; tongue white; thirst.

Rept. pulv. jalap ʒ i.

22d.—Purged three times yesterday; stools unnatural; pulse small and quick; skin hot; tongue white and parched; thirst.

Rept. pulv. purg. u. a.

23d.—Freely purged yesterday; stools improv-

ed in character; pulse and skin natural; tongue clean; still thirst.—Nourishing diet.

Vesp.—Complains of having severe pain in the chest; breathing oppressed; pulse quick; skin cool.

Imp. empl. lyttæ, p. d. R. Calomel gr. viii. pulv. ant. gr. vi. in pulv. h. s. s.

24th.—The blister has risen well; breathing relieved; pain gone; tongue, skin, and pulse nearly natural; bowels free. He gradually recovered, and was discharged well on the 31st of the month.*

Had this man been bled immediately on coming into hospital, he would not have fallen into such imminent danger, and he would have been saved ten days' sickness.

Tanjore, 15th May 1826.—8 o'clock A. M.

——, a native of Tanjore, a middle-aged spare-made man, was disturbed two or three times during the night by calls to stool; since sunrise has had vomiting; slept in the verandah of his house; skin cold and damp; countenance distressed and much sunk; pulse quick and fluttering; lips and nails blue; has cramps in the hands and feet. There is considerable oppression of breathing, and restlessness; urgent thirst; forehead bathed in sweat.

Cholera was prevalent in the district, and within the fort of Tanjore, two miles off; the mortality

* Journal of Cases.

from the disease was reported to amount to 15 a-day.

Immediately bled to twenty ounces, when the stream had become free, and the patient felt the greatest relief.

R. Calomel, gr. v. camphor, gr. iii. opii, gr. i. ol. menth. pip. gt. v. in pilul. stat.

Apply hot sand in bags to his extremities, and frictions to the whole body; and let him have brandy and water for drink.

9 o'clock A. M.—Pulse steady; countenance improved; heat of the body improving; no return of vomiting; has had one of the peculiar congee-like stools.

Habt. spt. æther sulph. ʒ ss. tinct. opii, gt. xv. spt. menth. pp[tæ.] gt. x. mist. camphoræ, ℥ i. fiat haust. stat. sum.—Cont. brandy and water.

10 o'clock A. M.—Much the same.—Cont. ut supra.—Noon. Is dozing and quiet; feels quite easy; pulse steady; skin warmer.

Omit haust. cont. brandy and water, p. r. n.

1 o'clock P. M.—Continues to improve; omit brandy and water.—To have congee (rice gruel) for drink.

Habt. calomel, gr. x. ext. hyoscyam. gr. v. Mis. ft. pil. stat. sum.

6 o'clock P. M.—Has slept since last report.

R. Ol. ricini, ℥ i. tinct. opii, gt. x. aquæ cinnamom. ℥ i. M. ft. haust. stat. sum.

10 o'clock P. M.—Has had some dark-coloured stools, and has made water; feels well, and says he

is hungry.—To have mulligatany and rice, and to be kept warm during the night.

16th.—Passed a pretty good night; several dark-brown and green stools; complains of nothing but weakness; pulse and skin natural.

R. Ext. colocynth. gr. xii. hyoscyam. gr. vi. calomel, gr. iv. Mis. ft. pil. iv.—Sign. two immediately, and two in three hours.

Vesp.—Has had several stools, which were latterly feculent. To have nourishing diet. Rept. pil. ut supra, cras mane sumend.

17th.—Convalescent. 20th.—Discharged well.

I consider it so important to establish the character and value of venesection in the treatment of Cholera, that I will take the liberty of adding the opinion of some of the Indian practitioners, whose practice has been most successful in overcoming the disease.

Mr Assistant-surgeon J. Cox says, "On the even-" ing of the 7th instant, (September 1818), I was " called to a poor man in the village, (Bagracottah, " S. Mahratta country), about 6 P.M.: he had been " labouring under the disease since the early part " of the morning, and was extremely weak when I " saw him, and much affected with spasms of the " extremities and muscles of the abdomen; skin cold " and clammy, pulse very slow and indistinct. Un-" der such symptoms, I must acknowledge I was a " sceptic on the propriety of blood-letting, but was " anxious to try its effects in the first case that

" might present itself. I immediately gave the " man 40 drops of laudanum in an ounce of warm " Holland-gin, and applied warm chatties of water " to the feet, and friction over every part of the " body, and opened two veins in the arm, and with " great difficulty got 12 ounces of blood away. I " was happy to see the man did not sink under the " operation, but, on the contrary, appeared revived; " and towards the end the blood came away in a " stream, and more florid in appearance. On open- " ing the veins, it appeared blacker than venous " blood in general, and in a half coagulated state; " so much so, that it was only by frequent pressure " upwards on the veins from the wrist, that I could " procure any stream at all. I remained with him " an hour after the bleeding, and was pleased at " seeing him no worse than when I first saw him; " indeed he appeared more tranquil from spasms, " and the pulse if any thing better: the frictions " were continued. I now gave him 15 grains of " calomel, and washed it down by the draughts " of laudanum and gin, and left my dresser with " him to superintend the frictions, and to re- " peat the draughts should he vomit the former " ones up. At 9 o'clock, near three hours after " the bleeding, he had not been purged or sick " once; entirely relieved from spasms; every part " of the body felt warm, and the pulse had re- " turned distinctly to the wrist, though faint. " The friction was ordered to be continued, and " some warm soup was made similar to mulliga-

" tany with pepper, and given him to drink in " small quantities during the night. On the morn- " ing of the 8th the report was favourable. Had " slept a part of the night, or rather towards morn- " ing; had no spasms, and felt debility only; pulse " increased; skin dry and warm. An ounce of ol. " ricini was given him at eight o'clock, which in " the course of the day produced three stools—the " first bilious, of a dark green colour, and the " others more natural. I ordered him to continue " the warm soup as his diet, and to take four grains " of calomel at bed-time, which was all that was " done in this case. The man came to me a few " evenings ago quite well, and said he had pur- " sued his usual labours for several days past."— Madras Report, pp. 102, 103.

Mr Staff-surgeon Trotter says, (Camp near Gudduck, S. Mahratta country, 1st May 1819), " The " cases were in general unattended with spasms or " vomiting. The patient sinks immediately after " one or two watery stools. In these cases, hot spi- " rits with spices, and the application of heat, proved " of most use. The purging was always stopped " in a short time by the anodyne injections. So " great a repugnance had the natives to bleeding, " that it was a considerable time before I could " prevail upon them to adopt it, and not until se- " veral fatal cases had happened. The first man " on which it was tried, was looked upon by his " friends as being completely out of the reach of

" medicine. They were therefore highly surprised " at the good effects of it, especially when out of " the next ten that were bled not a case terminated " fatally. A few were bled at an advanced period " of the disease, but it appeared to hasten their " dissolution."—Madras Report, pp. 108, 109.

Mr Superintending-surgeon Duncan says, (Bellary, 25th September 1818),—" P. S. I have just " seen five men of the 84th regiment brought into " hospital with the spasmodic Cholera. All of " them were immediately bled, and a cordial " draught given them of aromatic tincture of am-" monia in camphor mixture: four of them are " now asleep, with the pulse full and equal.—The " fifth man is in a restless doubtful state, having " been ill for some hours. No more than fourteen " ounces of blood could be taken from both arms, " dark and thick. His skin cold; his face sunk " and livid; the pulse not perceptible; and he " has the appearance of a person labouring under " epilepsy, apoplexy, or strangulation. His rest-" lessness prevented the application of leeches. " Cordial mixture, with tinct. opii, was frequently " given to induce sleep, which is the first symptom " of recovery."—Madras Report, p. 110.

Mr Surgeon Owen says, (Bellary, 13th October 1818),—" The two first cases were slight, and " yielded easily to laudanum and calomel. But we " had soon to observe, that with Europeans these

" medicines failed, though the disease was taken at
" the commencement, and the utmost attention
" paid to the treatment of it. The appearances,
" on dissection, have been so uniform in their ten-
" dency to prove the great necessity of relieving
" the circulating system, and preventing that con-
" gestion which has been in every case so appa-
" rent, that blood-letting became with me a pri-
" mary object of attention. I have therefore used
" the lancet with some degree of freedom. And
" where the disease would admit of a sufficient
" quantity of blood being abstracted, I have found
" it of the most essential service in relieving spasm,
" and the irritability of the stomach. But how far
" it can be used with safety, in weak and debili-
" tated constitutions, and old age, still remains
" doubtful. Yet in these even, if taken with *cau-*
" *tion*, and in *sufficient quantity in the first in-*
" *stance*, it will be found a valuable auxiliary.

" I have taken twenty ounces of blood from the
" arm of a delicate native woman with the happiest
" effect, where the spasms were very violent; no-
" thing more being required afterwards than a dose
" of calomel and rhubarb to open her bowels.

" You will observe in the case of Matrosstute,
" that thirty ounces of blood were taken before the
" spasms abated: although they afterwards returned
" with considerable violence, yet his pulse immedi-
" ately rose and became soft and full, and the heat
" returned to the surface. This, I am confident,
" would not have taken place, had not the circu-

" lating system been relieved in the first instance, " Nor do I think the same effect would have been " produced if this quantity of blood had been taken " at two or three times.

" I am happy to say, that I have not lost one " patient who has been bled, or at least when the " blood would flow in a moderate degree, so as to " relieve the most urgent symptoms."—*Ibidem*, p. 122.

In contrast to this strong evidence in favour of blood-letting in Cholera, I shall introduce a short paragraph from Mr Assistant-surgeon Hunter's report, published in the above work; which will also illustrate what I formerly said as to the fact of its having become, from the want of fixed principle in the treatment of this disease, a common opinion, that medical men know nothing of its nature or cure. Mr Hunter says, " In one case there was " considerable determination of blood to the head, " and suffusion of the eyes; *the temporal artery* was " opened, and about six ounces of blood abstracted. " The practice appeared pernicious from the pa- " tient sinking shortly afterwards."—*Ibid.* p. 139.

Assistant-surgeon M'Lean, of his Majesty's 53d regiment, says, (Trichinopoly, November 1818),— " The propriety of bleeding was strongly impress- " ed on my mind, from observing the turgid state " of the vessels of the several viscera of the thorax " and abdomen, as demonstrated by dissections, to-

" gether with the advice contained in the Medical " Board's circular to superintending surgeons. Of " fifty-six cases of spasmodic Cholera, who were " bled to fainting, only one died: small bleedings " are prejudicial, inducing debility without reliev- " ing the system; and I am induced to say as my " opinion, that a second bleeding does no good, if " protracted beyond six or eight hours after the " first; we should therefore bleed largely, or not " at all."—*Ibid.* p. 138.

Mr Assistant-surgeon Mather says, (Cochin, January 1819), " Bleeding was employed with suc- " cess in one case, in a very advanced stage of " the disease. The patient, who was no more " than 18 years of age, complained of giddiness " with a sense of weight in the head; he was rest- " less, and breathed with difficulty; he had been " twice on the steaming cot, but the pulse re- " mained undistinguishable, and the skin continued " cold. I succeeded in drawing about ℥ 12 of blood " from the arm; for no pulsation could be felt in " any of the branches of the temporal artery, and " I did not consider this a case in which I could " with propriety open the jugular vein. I was sur- " prised to find the blood had that bluish appear- " ance, indicating the formation of buff; but after " coagulation the surface had the tenacity of sizy " blood—the colour instead of being buffy was a " darkish grey or ash, and exhibited an appearance " I do not recollect having ever before witnessed.

" The weight in the head was somewhat relieved by
" bleeding; the pulse was just perceptible, though
" still restless; sleep took place at short intervals;
" the natural heat was gradually restored, and at
" length uninterrupted repose succeeded."—*Ibid.* p. 151.

I will conclude these extracts with a portion of what Mr Annesley says on the question of venesection in Cholera.—" That cases have occurred, " wherein 18 or 20 ounces of blood have been " taken away, and the patient died, cannot be " doubted; but in all these cases it will be found, " that bleeding ceased after the vessels had been " emptied, whether one or twenty ounces had been " abstracted. On the other hand, it will likewise " be found, that if the blood flows freely, till the " colour changes from black to red, the patient in " general will recover. When we observe, there- " fore, the thick black carbonated blood change " to a natural colour, and consequently to a thin- " ner consistence, we may rest satisfied that the " disease is under our controul.

" I saw a very striking instance of this fact in " the case of a young lady at Madras, who was at- " tacked with Cholera. The symptoms were de- " cidedly marked, and the usual remedies were " applied. The pulse was fluttering, and seemed " oppressed. I ordered a vein to be opened, and " gave particular direction to the gentleman who " was in attendance with me, and in whose obser- " vation and judgment I had the fullest confidence,

" (Dr Archer), to let the blood flow till its colour
" changed from black to red, without reference to
" quantity. At first it came away only in drops,
" and was exceedingly thick and black. Warm
" flannels were used to the arm, and in a few mi-
" nutes the blood began to flow more freely, but
" still in a very languid stream. After three or
" four ounces had been taken, the colour changed;
" it flowed with perfect freedom. The pulse got
" up, became more regular and soft, and although
" not more than eight ounces were taken, the pa-
" tient recovered rapidly.

" Although I recommend bleeding to be at-
" tempted at all times, and in every stage of the
" disease, I am fully aware that many cases have
" recovered where it has not been used at all, nor
" do I answer for its universal success; but I do
" venture to assert, that if it can be accomplish-
" ed in the early stage of the disease, and before
" the circulation has ceased at the wrist, in nine
" cases out of ten it will prove successful, espe-
" cially if the colour of the blood change from
" black to red, if the pulse get up, and the spasms
" be relieved."—*Annesley on the Diseases of India*, pp. 169, 170.

He, in the next page, strengthens these opinions by a reference to the successful practice of Mr College, surgeon to the General Harris East Indiaman. This gentleman, " whenever he observed any of
" the crew depressed and low-spirited, at once
" inquired into their feelings, and, without a mo-

"ment's hesitation, took twenty or thirty ounces "of blood from the arm, gave a scruple of calo- "mel and two grains of opium, and sent them on "shore, well wrapt up, to the General Hospital "under my charge; and the subsequent disease "showed what might have been expected from less "energetic measures."—*Ibid.* p. 170.

Upwards of fifty men were thus treated, and every one of them recovered, so as to be able to join their ship before she left Madras Roads.

THE END.

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